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Rev. C. J. S. Bethune, M.A., D.C.L., F.R.S.C.,

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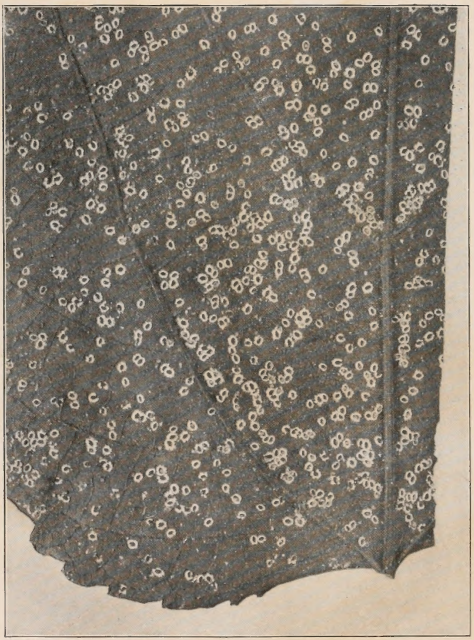
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PHOTOGRAPH OF ALEURODES MORI ON UNDER SIDE OF MULBERRY LEAF, ENLARGED ABOUT TWO-THIRDS DIAMETER.

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NEW, OR LITTLE KNOWN, ALEURODIDÆ.—I.

BY A. L. QUAINTANCE, ENTOMOLOGIST, FLA. EXP. STATION.

Aleurodes mori, n. sp.

Egg.—Length, .16 mm.; width, .08 mm.; elliptical, curved, light brownish in colour, marked with minute polygonal areas; pedicel short, about one-tenth length of egg.

Larva.—Length, .43 mm.; width, .3 mm., varying somewhat; shape, elliptical; colour, whitish or yellowish white. Margin all around dentate, due to the usually short but acute incisions between the closely-set wax tubes. A very fragmentary marginal fringe frequently present; no submarginal rim as in pupa-case. Wax tubes plainly extending mesad four to five times their breadth, then gradually disappearing. Abdominal segments moderately distinct. Eye spots small, reddish. Dorsal tubercles and setæ usually present as on pupa-case, but those of thorax sometimes wanting. Vasiform orifice, operculum and lingula essentially as in pupa-case. Exuviæ from preceding moults frequently remain attached to larva.

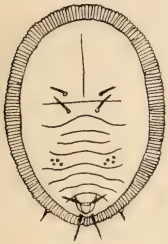
Pupa-case.—Length, .7 mm.; width, .55 mm.; shape elliptical, varying somewhat in size and shape. Under hand-lens, shiny black in colour; dark brown by transmitted light under microscope. Conspicuous white cottony fringe all around; wax rods, closely matted together at base, distinctly becoming more separated, giving the outer margin of fringe a ragged appearance. There is a distinct marginal rim of wax tubes, which extend mesad with varying distinctness to the inner margin of rim. Outer margin crenulated, due to the shallow and usually rounded indentures between wax tubes; rim marked with minute dots.

Abdominal segments moderately distinct; abdomen slightly raised along dorsi-meson, particularly from about the third segment caudad, including vasiform orifice. Third thoracic segment moderately distinct, straight. A median suture extends cephalad to marginal rim from first abdominal segment. On the dorsum of both mesothorax and metathorax

near dorsi-meson is a pair of small brown setæ ; also a pair of setæ near vasiform orifice, and on caudal margin of case. This latter pair is usually larger than the others, the setæ extending dorso-caudad, some distance beyond the margin. There is a pair of minute setæ on the margin of case, one on each side, near the caudo-lateral region. On the fourth abdominal segment on each side there is a group of from four to six minute pores One or two pores are sometimes present on fifth segment on each side, just caudad of those on fourth. Vasiform orifice somewhat elevated, small, sub-elliptical, wider than long. Operculum nearly filling orifice ; cephalic edge straight, lateral and caudal margins parallel with margins of orifice. Lingula rather short, not reaching margin of operculum. Rudimentary feet on ventral surface distinct.

Adult.— ♀. Length about .8 mm. ; length of front wing, .833 mm. ; width of front wing, .3 mm. ; length of antennæ about .25 mm. ; length of hind tarsus, .16 mm. ; length of hind tibia, .28 mm. Colour, bright yellow ; tarsi and distal end of tibiæ more or less reddish ; eyes deep brownish-red, varying to brownish-black. Wings all around on margin reddish, deepest on cephalic margin of first pair. First pair of wings spotted with bright red and brownish-black ; two irregular red spots near proximal third, one on each side of the main vein, the smaller spot on cephalic side ; caudal spot irregularly T-shaped. There are three or four brownish-black spots on the distal fourth of wing ; one at tip, into which the vein merges, one cephalad, and one caudad of vein, with a fourth sometimes present near vein, somewhat proximad of the others ; a light clouding may also sometimes occur at base of wing just caudad of basal veinlet.

Antennæ of seven joints. First joint short, sub-conical, not quite one-half length of second ; second joint pear-shaped, somewhat truncate distally, about three-fourths as wide as long ; third joint long, slender, slightly longer than the distal four together ; fourth short, cylindrical, about one-half length of fifth ; fifth, sixth and seventh subequal in length ; fifth and sixth sub-cylindrical ; seventh somewhat fusiform, tapering distally and bearing a terminal seta. Joint third, and distally, rather minutely ringed. In third pair of legs, femur about three-fourths length of tibia. Tarsus and claw together about three-fourths length of tibia. Distal tarsal joint, excluding claw, four-fifths length of proximal. Mentum three jointed ; proximal joint long, slender, about six-sevenths length of distal two together ; second joint short ; third, about a fourth longer than



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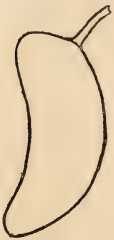
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ALEURODES MORI, QUAINTANCE.

FIG. 2.—Pupa-case, showing structural details.
FIG. 3.—Margin of pupa-case, greatly enlarged.
FIG. 4.—Vasiform orifice, operculum, and lingula of pupa-case.
FIG. 5.—Right fore wing of female.
FIG. 6.—Genitalia of male.
FIG. 7.—Egg.
FIG. 8.—Illustrating the polygonal markings on egg.

second. Mentum club-shaped, thickest at distal part of second joint, tipped with black. Rostrum short, conical, bearing three long setæ.

Eyes oblong, constricted somewhat above the centre, giving somewhat of a "dumb-bell" shape. Dorsal tubercle (operculum) when elevated and seen in lateral aspect, conical; lingula long, tapering, covered with minute hairs. Operculum, when not elevated, and seen in dorsal aspect, strongly convex, bearing a row of minute hairs on caudal margin; lingula protruded, reaching considerably beyond operculum. Genitalia acutely conical. Margin of wings delicately beaded all around; beads setate. At base of second pair, on cephalic margin, are seven to nine setæ, four of which are usually paired. Median vein of first pair of wings unbranched, extending almost to distal end of wing; nearer cephalic than caudal margin proximad, but curving gradually caudad in distal half, dividing this part approximately in the middle. A short veinlet arises from base, apparently distinct from median, and extends obliquely to caudal margin of wing.

Length about .58 mm.; proportionately smaller than female. Genitalia forcipate; penis about three-fourths the length of valves; curved, suddenly enlarged at base. In other respects essentially as in female.

This Aleurodid occurs in great abundance on the under surface of the leaves of mulberry *(Morus)* at Tampa, Florida. Figure 1, from photograph, enlarged about two-thirds diameter, will serve to illustrate this. The insect occurs in some abundance at Lake City, on the leaves of various trees, as *Tilea Americana*, *Callicarpa Americana*, *Liquidamber straciflua*, *Ilex opaca*, and less frequently on *Persea Carolina*.

Under date of April 26th, 1898, Prof. Cockerell sent me specimens of what are doubtless this insect, on a creeper from Kingston, Jamaica.

ODOUR OF SAN JOSE SCALE, ASPIDIOTUS PERNICIOSUS.

BY F. M. WEBSTER, WOOSTER, OHIO.

In the many accounts of this insect, I do not recall that attention has been called to the odour that is associated with this insect, and which, in cases of excessive abundance, can be detected at a considerable distance away. Where the air is quiet it is often possible to detect the presence of a badly infested tree a yard away, and I presume that with more acute olfactories, such as insects are supposed by many to possess, even the presence of a more limited number of the scale might be detected at a much greater distance. As ants do not appear to be at all partial to this Coccid, at least in this country, it is not easy to understand what influence this odour can have in the economy of the species. It is possible that, in its native home, this odour might attract other insects and thus afford a means of diffusion, not at present so available to the scale in this country.

FIVE NEW COCCIDÆ.

BY EDW. M. EHRHORN, MOUNTAIN VIEW, CAL.

Ripersia arizonensis, n. sp.

♀ enclosed in a broadly oval snow-white waxy sac, about 3 mm. long, 2 mm. wide, 1½ mm. high, sac widest between middle and caudal end.

♀ oval, about one-third longer than broad, shiny, light purplish-brown, about 3 mm. long. When boiled in K. H. O. turns reddish-brown. Derm colourless, with numerous bristles scattered over the dorsum. Antennæ 6-jointed: 6 longest, joint 4 shortest; formula, 6, 1, 2, 3, 5, 4. Each joint with several hairs, joint 6 quite bristly. Legs light brown, quite stout. Femur longer than tibia. Tibia very little longer than tarsus. Tarsal digitules long fine hairs. Claw slender and curved, digitules of claw very short and slender. Anal lobes prominent, with very long bristle at tip, and several stout ones on its margins. Anal ring large, with 6 bristles. *Hab.*—In ants' nest on the roots of *grass* and *Artemisia*, sp., Camp Thurber, Grand Canyon of the Colorado, Arizona.

[This peculiar insect may form the type of a new sub-genus, *Cryptoripersia*, Ckll., which will be distinguished by the possession of a complete subpyriform brittle sac. The following measurements in μ μ will assist in the recognition of *Ripersia arizonensis*: Anterior leg: femur, 116; tibia, 83; tarsus, 60. Antennal segments: (1) 41, (2) 33, (3) 33, (4) 25, (5) 33, (6) 61.—T. D. A. Ckll.]

Kermes ceriferus, n. sp.

♀ scale globular, about 4 to 4½ mm. in diameter, ground colour brown, shiny, dotted with black spots. Scale completely covered with dirty white wax. Segmentation obsolete, only indicated by black markings. Ventral slightly pubescent. After boiling in K. H. O., derm colourless, with numerous small round glands and brown spots. Antennæ very small, joints obscure, last joint with numerous hairs. Legs quite stout, claw curved.

Larva about twice as long as broad, reddish, turning yellow when dead. Eyes red. Antennæ 6-jointed: joints 3 and 6 about equal, joints 1 and 2 equal, and 4 and 5 equal. Formula (63)(12)(45). Rostral loop reaching half way between last pair of legs and tubercles. Legs large and stout. Tarsus twice as long as tibia. Claw long and curved. Margin of each segment with stout curved spine. Caudal tubercles very large, each bearing one very long bristle and three stout spines.

Hab.—On *Quercus*, sp. Walnut Creek Canyon, near Flagstaff, Ariz.

Ripersia villosa, n. sp.

♀ in clusters and single in the crotches of twigs of oak. Sac loosely woven of long white wool, oval, about 2 mm. long and 1 mm. broad.

♀ when removed from sac bright crimson, slightly covered with white powder, skin shiny; about 1.5 mm. long, 1 mm. broad, tapering anteriorly and quite convex dorsally. When boiled in K. H. O., derm colourless, densely covered with slender hairs. Antennæ light brown; 7-jointed. Joint 7 longest. Sometimes joint 1 is next longest, but joint 2 is often longer than 1, and in many cases they are subequal; joint 6 usually next, although joint 3 may be longer than 6; joint 4 next, often subequal with 5; sometimes 3 shortest, sometimes 5; 3 and 5 often subequal. In fact, the sequence of the joints is quite variable, as is shown in the following antennal formulæ:

7 2 1(36)(45)
7(12)6(45)3
7 1 2 6 4(53)
7(12)64(53)

Joint 1 is stouter than any of the others. Each joint with hairs, joint 7 with several stout hairs. Legs light brown, large and stout; each joint furnished with one or more rather long bristles. Femur, 80 × 50 μ. Tibia, 70 μ. Tarsus, 50 μ. Claw, 20 μ. Digitules of claw knobbed, moderately short and stout. Tarsal digitules long, fine, slightly knobbed hairs. Tubercles small and rounded, with long stout bristle. Anal ring with six stout hairs.

Larva when newly hatched, colour light red, rostral loop extending beyond body.

Hab.—On *Quercus agrifolia*, at Berkeley, California.

[This species is probably most nearly allied to *Dactylopius Quaintancii*, Tins., from which it differs in being more distinctly a *Ripersia* in the general appearance of both the antennæ and legs.—J. D. Tinsley.]

Dactylopius formicarii, n. sp.

♀ small, broadly oval, slightly covered with powder, about 2 mm. long and 1 mm. broad. Colour yellowish-brown; when boiled in soda, turns red. Epidemis of dorsum with scattered spinnerets and hairs on thorax; on abdomen these become more numerous posteriorly, especially the hairs, which are quite numerous on the last 4 segments. Ventrally the long slender hairs are quite numerous on all the segments, but especially so on

the last abdominal segments. Sides with rows of spinneret spine areas. Antennæ 8-jointed in some, 7-jointed in others, nearly concolorous with the body. Joint 8 longest; next is 2, joint 1 usually next, although 3 may be longer; 5 next, always appreciably longer than 7; 6 may be either shorter or longer than 7; 4 always shortest.

Many of the antennæ are 7-jointed through failure of the 3rd to divide; the 3rd is always then quite long. Formulæ:

8-jointed = 82135764.

7-jointed = 7321456.

The joints of the antennæ bear very long, rather stout, hairs.

Legs stout and quite hairy. Femur shorter than tibia. Tibia, 215 μ long. Tarsus, 110 μ long. Claw rather stout, 37 μ long. Digitules of claw fine knobbed hairs reaching beyond claw. Tarsal digitules long slender hairs. Caudal lobes small, rounding, with one very long (200 μ) stout bristle and several shorter ones, also numerous round glands. Anal ring large, with 6 moderately long hairs.

Hab.—*In ants' nests* on the roots of *Artemisia*, sp. Thurber's Camp, Grand Canyon of the Colorado, Arizona.

[Antennal formula approaches that of *D. solani*, Ckll., but the great hairiness of the body and antennæ readily separate it from that species.—J. D. Tinsley.]

Kermes Pettiti, n. sp.

♀ scale about 4 mm. broad, 3 mm. long, and 3 mm. high, dark purplish-brown; some individuals of a lighter colour and marbled with brown. A distinct longitudinal groove on the meson indicated by a dark line. Surface without minute black specks. Segmentation not very distinct, indicated by rows of black spots plainly seen through a pocket lens. Ventral surface, where it touches the bark, flattened and more or less covered with a yellow secretion. Beak very prominent. When removed from twig scale leaves a whitish powder. When boiled in K. H. O., derm colourless, except numerous brown spots with black centres scattered over the dorsum. Antennæ very obscurely 6-jointed, joint 3 apparently longest. Legs very small and stout. Tibia as broad as long, with a stout spine. Femur and tibia about equal. Tarsus nearly twice as long as tibia. Claw straight.

Hab.—On *Quercus*, sp.; Ithaca, N. Y.; sent to me by Mr. R. H. Pettit as *K. galliformis*, Riley. I take pleasure in naming this species after the collector. Specimens have been examined by Mr. Cockerell, who agrees that they represent a new species.

PAPILIO AJAX, VAR. MARCELLUS, IN BRITISH COLUMBIA.

I have lately received from Mr. C. De Blois Green a painting, natural size, of a butterfly which is undoubtedly *P. Ajax*, var. *Marcellus*. Mr. Burton, the captor, took the specimen on the Cowichan River, near Duncan's, in Vancouver Island, where he spends part of every summer fishing. It was upon one of these expeditions that the specimen referred to was taken, and another one was seen during the same summer, but not secured. The painting which was afterwards made by his wife is well done, and there is no doubt at all about the species. Mr. Burton formerly collected insects in England, but has not exchanged with anyone in the United States, or even had a collection in his possession for many years. There is hardly a possibility, therefore, that any mistake has been made as to the actual locality where this specimen was caught.

A point of considerable interest is, What was the food plant of the larvæ of these butterflies? The Papaw, which is, as far as I know, the only food plant, does not grow in British Columbia, nor, as far as I am aware, further west than Nebraska.

I shall be obliged if any reader of the CANADIAN ENTOMOLOGIST can give any further information on the food plants of this species, or suggest any probable food plant upon the Pacific coast.

J. FLETCHER.

DESCRIPTION OF A NEW PSILOPA.

BY D. W. COQUILLETT, WASHINGTON, D. C.

Psilopa petrolei, new species.

Black, polished, not light coloured, pruinose except the lower part of the occiput, cheeks and sides of face, which are thinly grayish pruinose; halteres yellowish, the knobs white. Eyes densely hairy, most approximate at middle of face. Third joint of antennæ slightly longer than the second, the spine of the latter not reaching beyond the apex of the antennæ. Wings hyaline, tinged with gray on nearly the costal half, except sometimes a spot toward apex of the submarginal cell; apex of second vein nearly twice as far from the first as from the apex of the third vein. Length, 2 mm.

Described from eight specimens reared from larvæ living in crude petroleum near Los Angeles, Cal.

Type No. 4,100, U. S. N. M. This description is published at the request of Dr. L. O. Howard, who has prepared an article on the habits of the insect.

LIFE-HISTORY OF THE SHEEP SCAB-MITE, PSOROPTES COMMUNIS.

BY C. P. GILLETTE, FORT COLLINS, COLORADO.

I am not aware that the full life-history of this insect has been published, though I shall not be surprised to learn that such is the case.

In order to know how long a time should intervene between the first and second dippings for the cure of scab, we must know the period of incubation and also the entire time elapsing from the deposition of the egg up to the time that the mite from that egg, if a female, may be itself depositing eggs. These points were determined in a series of experiments conducted by the writer one year ago and were reported in a local paper, the "Fort Collins Courier," last spring. I took seventy-five eggs from a lock of wool drawn from the back of a badly infested lamb, and, after dividing them in two nearly equal lots, placed them at once on the skin of the backs of two lambs that were not infested with the mites at the time. In order to irritate the surface a little and better prepare it for the little mites that would begin at once to hatch, a lock of wool was drawn in each case from the particular spot where the eggs were placed.

Mr. Ball, assistant in my department, made a careful examination of these "cultures" once a day until the mites from the eggs were fully grown and themselves laying eggs.

At the first examination a few young mites were found, which was to be expected, as a few eggs among so many would be about ready to hatch. At the end of the fourth day all the eggs had hatched. At the end of the ninth day a few individuals were found in copula ; and on the eleventh day eggs were found. As it required four days for the newly deposited eggs to hatch, the entire time elapsing from egg to egg would be fourteen or fifteen days.

As there would be eggs in all stages of incubation upon a sheep when the latter is dipped for the cure of scab, I have set the limit of time for the second dipping at not sooner than five days, and not later than ten days after the first dipping. If the second dipping comes at a time outside this limit, there will probably be eggs upon the sheep again.

AMERIA TEXANA, French.

From a comparison with an example recently sent me by Mr. Harrison G. Dyar, from the Smithsonian Institution, I find that this is synonymous with *Pagara simplex*, Walker. *Ameria texana* will then be known as a synonym.

G. H. French.

ASPIDIOTUS FERNALDI (Ckll.), Sub-sp. COCKERELLI, Sub-sp. Nov.

BY PERCY J. PARROTT, MANHATTAN, KANSAS.

♀ scale nearly circular, somewhat flattened, little convex, roughish, dark gray above bark, reddish-brown below bark, 2 mm. diameter; exuviæ little exposed, often concealed by whitish secretion, orange, placed to one side of centre; ventral scale, delicate and white; old scales dark brown, often almost black. Scales are thickly massed.

♀ oval, white, marked with irregular light yellow spots; first and second lobes, and margin of last segment, yellowish.

Five groups of ventral glands; median 2 to 5, cephalolaterals 11 to 18, caudolaterals 7 to 18.

Two pairs of well-developed lobes; the mesal somewhat oblique, with one notch on lateral margin; the second pair somewhat angular and inclined to mesal lobes, notched on margin; dark, unequal processes mesal of mesal lobes and sides of incisions, those mesal of first incision large and conspicuous. (Fig. 9.)

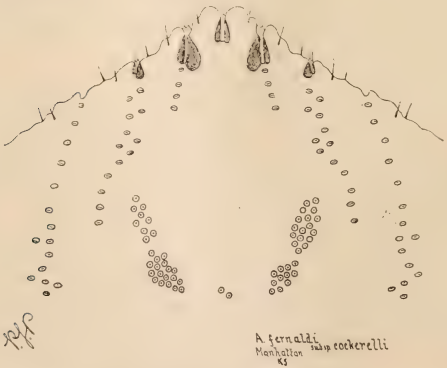


Fig. 9.—Characters of female. (Original.)

One small spine on lateral of mesal lobes, two conspicuous ones on margin of 2nd pair of lobes and lateral of 2nd pair of incisions, respectively.

Plates simple, often undiscernible; when present, one or two caudad of each incision.

Very common under the rough bark on the trunks of maples in Manhattan, Kans. Collected Sept. 18, 1898.

"The species is closely allied to *Aspidiotus Fernaldi*, Ckll., which occurs on honey locust in Massachusetts, but differs from it by the narrower, notched, median lobes and the more numerous glands in the groups."

It is with the greatest pleasure that I dedicate this species to Prof. T. D. A. Cockerell, who first led me to study the Coccidæ, and has given me his valuable assistance and encouragement while studying them. I I am also indebted to him for the quoted passages, which I have taken from his manuscript.

Scales were collected from Juneberry in the same vicinity as the maples, which intergrade between the maple insect and Fernaldi. "They constantly agree with the maple species in having many glands in the groups, but some have lobes as in the maple species, while others have lobes just as in *Fernaldi*. (Fig. 10.) Some of the Juneberry specimens



FIG. 10.—Variations of characters of females from scales on Juneberry. (Original.)

can only stand as Fernaldi, var., for they differ in no tangible character except the rather more numerous glands in the groups." The number of spinnerets for the Juneberry specimens are as follows: median, 2–3; cephalolaterals, 8 to 18; candolaterals, 8 to 13. In exterior appearance the scales resemble the maple specimens, but are not so numerous nor so evenly distributed, being found in small separate clusters. Collected in Manhattan, Kans., July 23, 1898.

A NEW BUTTERFLY FROM UTAH.

BY HENRY SKINNER, PHILADELPHIA, PA.

MELITÆA MARIA, n. sp.—Male: Expands 1½ inches. Upper side. Primaries. The outer margin of the wing has along its edge about eight brick-red spots; internal to these is another row of yellow spots, separated from the former by a very small space. Next comes a row of yellow spots, the first four having an outward curve, and the lower three an inward curve. There then comes a row of quadrate brick-red spots, nearly parallel to the preceding yellow row. At the end of the cell are three yellow quadrate spots. The cell has in it two comparatively large red spots, outlined with black, and having a yellow patch between them and another toward the base. There is also a quadrate yellow spot with concave sides in the space below the third median nerve. The secondaries are marked in a similar manner.

Under side. Primaries. These are light brick-red, with two spots in the cell of the same colour encircled with a black line; beyond the cell are three oblong yellow spots; still further toward the tip are two rows of yellow spots edged with black. The lower half of the wing is immaculate, with the exception of a yellow dot below each median nerve. On the secondaries are about six rows of spots, the rows being alternately red and yellow, narrowly edged by black. The female is somewhat larger and darker in colour, having less yellow on it. This species belongs to the *Anicia* group, but is lighter in colour than the other species, having more yellow spots. The wings are also narrower. The under side is light in colour, similar to *Acastus*. Described from a number of specimens taken at Park City, Utah, June 26th, 1895, by Prof. A. J. Snyder, and named in honour of his wife, who is an ardent collector and student of the Lepidoptera.

A SERIOUS ATTACK ON THE APPLE FRUIT BY ARGYRESTHIA CONJUGELLA (ZELL.) IN EUROPE.

BY ENRIO REUTER, HELSINGFORS, FINLAND.

In the annual reports of the Canadian Experimental Farms for 1896 and 1897, Dr. James Fletcher describes a new apple-fruit pest in British Columbia, caused by the attacks of small caterpillars, viz., the larvæ of a little tineid moth, *Argyresthia conjugella*, Zell. The injuries done by this new enemy, called by Mr. Fletcher "the apple-fruit miner," closely resemble those caused by the apple maggot, *Trypeta pomonella*, Walsh.

The caterpillars tunnel the pulp of the fruit in every direction, leaving brown-coloured channels with rather large chambers here and there ; this attack thus being easily distinguishable from that of the common codling worm.

According to Mr. Fletcher, this apple pest has not previously been noticed in America, and Lord Walsingham, of Thetford, England, that well-known microlepidopterologist, to whom a specimen was sent for determination, states that *Argyresthia conjugella* in Europe feeds on the fruit of *Pirus (Sorbus) aucuparia*, but has not been recorded from *Pirus malus*. At least no injury of this insect on apples has, as far as I know, until now been observed in Europe.

Last summer, however, an apple pest, quite similar to that described by Dr. Fletcher, has been injuriously abundant in Finland, the apple fruits in almost every orchard having been very seriously injured by small caterpillars and often completely spoiled for use. There can be little doubt that these caterpillars are the larvæ of *Argyresthia conjugella*, one of our commonest tineids.

The unexpected and violent attack of an insect, not previously known in Finland as an enemy to the apple fruit, is peculiar enough, but I think it will be a matter of still greater interest, since we may be able to point out the cause of this phenomenon.

The caterpillar, as stated above, ordinarily feeds in our country on the fruits of the Mountain Ash *(Sorbus aucuparia)*, and sometimes also on those of the Bird Cherry *(Prunus padus)*. In 1896 and 1897, especially in the latter year, the Mountain Ashes bore fruits in uncommonly great abundance, which was an extraordinarily great advantage for the multiplying of the insect. But this summer the fructification of the Mountain Ash, as well as of the Bird Cherry, almost *totally failed throughout Finland. The insect could not find its ordinary food, it must try to obtain another, and the egg-laying moths*, swarming in immense numbers, *instinctively flew to the apple trees to lay their eggs.*

In a letter recently received, Dr. Fletcher informs me that this insect during the past season was again very destructive to fruits in British Columbia, and, although he could not confirm it, he was told that the prunes were attacked as well as the apples. If this were really the case, the fact stated above, that the larvæ attack also the Bird Cherries, seems to be of considerable interest.

Prof. M. Matsumura, of Sappora, Japan, has described[1] an injury to apples caused by another little tineid belonging to the family *Lavernidæ*, and probably to the species *Laverna herellera*, Dup. In a footnote Dr. L. O. Howard[2] suggests that this insect may be identical with *Argyresthia conjugella*, and that the Japanese insect has been introduced into British Columbia. To judge from the figures, drawn by Prof. Matsumura, of this Japanese insect, and especially of an apple infested by it, and considering, further, the description given by the same author, the Japanese insect certainly does not seem to be identical with our Finnish *Argyresthia conjugella*. The injury caused by *Argyresthia conjugella* on the apple fruits, as described above, is, in fact, quite different to that of the Japanese insect. Dr. Fletcher also points out in his letter that the figure given of the Japanese insect and the description of its work do not quite agree with the Canadian *Argyresthia*.

The injury of *Argyresthia conjugella* is, indeed, a very characteristic one. As this apple pest appears in quite a similar manner in two countries geographically so widely separated as British Columbia and Finland, and as, further, both these attacks are of quite a different nature from that caused by the Japanese insect, we must conclude that the Japanese pest is not identical with that occurring in Canada and Finland.

THE BITE OF OTIORHYNCHUS OVATUS.

BY JAMES FLETCHER, OTTAWA.

Otiorhynchus ovatus is an insect which, during the last decade, has become decidedly more numerous in Canada than was formerly the case. Little seems to be known about its habits. It has been sent to me occasionally with complaints of its attacks upon various crops. Among these may be mentioned injuries to the growing stems of potatoes, and also injuries to fruit in the fruiterer's shop. The beetles have been also sent in frequently as having been found in considerable numbers huddled together in dwelling houses late in the autumn. Perhaps the most interesting complaint which has been made comes from Prof. W. L. Goodwin, of Queen's University, Kingston, who writes: "I send two specimens of a small beetle which caused so much annoyance in camps on Wolf Island, in the St. Lawrence, near Kingston, Ontario, in July last. It attacked us at night and bit with unpleasant severity." Upon writing to Prof.

1. M. Matsumura. Two Japanese insects injurious to fruits in: Bull. No. 10, new series, U. S. Dep. of Agric., Div. of Entom., Washington, 1898, p. 36–38.
2. Loc. cit., p. 37.

Goodwin for exact particulars, and to the suggestion that he might possibly have been mistaken as to the identity of this nocturnal assailant, the following letter was received :

"As to our experience of last summer, there can be no question as to the guilt of *Otiorhynchus*. I was awakened several times by the pain of the bite, and caught the culprit red-handed, and having crushed him safely to destroy his powers of locomotion, I laid him in a safe place to identify him the next morning. The bites are very painful, as compared with those of other pests. They itch for a long time, and do not heal sometimes for a week or two. I examined the mouth of our little enemy with a microscope, and concluded that it was a biting mouth and not a piercing mouth. The other members of our camp were also attacked. The beetles were found constantly in our bed clothes, and there can be no doubt, I think, as to this apparently acquired habit."

ON THE RELATIONS OF A SPECIES OF ANT, LASIUS AMERICANUS, TO THE PEACH ROOT LOUSE, APHIS PRUNICOLA.

BY F. M. WEBSTER, WOOSTER, OHIO.

Some years ago, Dr. Erwin F. Smith* called attention to the fostering of this aphis by a species of ant, *Lasius claviger*, and, although not able to actually witness the act, his studies of the actions of this ant about the roots of peach trees infested by this aphis led him to believe that the former brought the latter from below ground in spring and placed them upon the twigs, thus indirectly if not directly causing their diffusion in orchards.

This *Aphis prunicola* is quite abundant in some localities in Ohio, and I have observed it on the twigs of peach trees as late as early December. Having lately had occasion to study this insect on the roots of young peach trees, I was, equally with Dr. Smith in his previous observations on this aphis, very strongly impressed with the attention given them by ants, in my cases this being *Lasius americanus*, Em.

Not only have I been able to observe the attentions of this ant in caring for the aphid on the roots, but also found them transporting them about on the twigs, and, while I too was unable to witness the actual transportation of the aphis from root to twig, I have no doubt that it is done and also that this transportation is carried on from twig to root. If we examine closely it will be observed that this ant burrows down about

*Entomologica Americana, VI., pp. 101-103 : 201-207, 1890.

the bases of young peach trees from the surface of the ground to the crown, and when the soil is somewhat heavy and packed closely about the base of the tree, these burrows are excavated close to the bark, which is here very soft and tender, and in some cases even the bark itself has been gnawed away, thereby giving the surface an irregularly grooved appearance, but clearly marking the directions of the burrows. This disposes of the question of the ability of this ant to excavate in the tender bark of the roots and about the crown of young peach trees.

Below ground I always find this aphis clustered on the most tender roots or rootlets, as stated by Dr. Smith, and with ants in constant attendance, promptly removing their wards whenever these are brought to light by my digging. But in cases where there was a lack of rootlets, a condition of affairs was encountered that was alike perplexing and interesting. The bases of some of the roots, and also the crown, had patches of bark removed and the wounds had every appearance of having been caused by the gnawing away of the bark, the detached bits intermixed with the escaping sap being present, and the most persistent search failed to reveal any organism capable of doing this, except the ants, of whose ability to gnaw the tender bark of the lower portion of the tree there was ample evidence between the crown and the surface of the ground. The object of these wounds, however, did not appear clear to me until on further examination it was found that where these wounds had begun to heal over, the lips thereof were closely packed with root lice, attended by this ant. It appears that this aphis can subsist from this tender growth of over-healing bark, as well as if they were colonized on the tender rootlets, and in the former case they may be observed collected along the edges of the wound precisely as does *Schizoneura lanigera*, about the overgrowing bark on the apple, in cases of wounds caused by a pruning off of a large limb. Where the wounds on the peach roots were infested by the aphis all bits of gum and detached bark had, seemingly, been removed, thus leaving a clear area for the work of the aphis, and here as elsewhere the ants were carefully looking after them.

When we come to recall the influence of other species of ants, and especially other members of this genus Lasius, on other species of aphides, it is impossible for me to escape the conclusion that we here have ample grounds for accusing *Lasius americanus* with intentionally gnawing the bark on the roots in order to furnish a supply of food for *Aphis prunicola*, Kalt., where there is a lack of rootlets for the required pasturage.†

†Read before the Ohio State Academy of Science, December 29, 1898.

A SOUTHERNER ARRESTED IN CANADA.

Towards the end of November last I had occasion—as I so frequently have—to test the patience and endurance of Dr. J. B. Smith, in order to obtain the names of some *Noctuids* taken here last summer; which he promptly determined and returned. In his letter to me accompanying the list of names, he says amongst other matters: "But let me ask of you what do you know concerning No. 11? This is *Acontia aprica*, var. *biplaga*. It is a very common species in Texas and in the South-west generally, and it has been found North as far as Southern Missouri; but I have never seen it any further North or East of that. Is there any chance of a mistake in the locality? This northward extension, if actual, would prove very interesting; but I must confess I am distinctly skeptical," which under such circumstances he was quite justified in being, and in requiring proof of its right to bear the London label. There are in Ontario two species of this somewhat extensive genus *Acontia*, (*Tarache*) *erastroides* and *candefacta*, which are present every season and nowise rare; but I have never heard of any other species of the genus as having been taken in it.

My evidence to the genuineness of the capture here is that Mr. Bice was at the time I got it constantly going the rounds of his daily occupation, and that he is not in communication about insects with anyone outside the city to get it from abroad. I saw him turn it with other things out of his cyanide bottle, which he told me were taken in a closed globe; that is, one closed at the bottom, where small specimens get quickly dried up, and have to be relaxed before they can be pinned with safety. I secured it there and then; relaxed it, pinned and spread it with special pleasure, because it was to me such a novel and attractive specimen. Dr. Smith acknowledged my answer to his question and considered the evidence satisfactory.

Such a find as that is well calculated to throw theories of distribution and exactly laid out Faunal Zones into confusion; but these, like all other human systems, are rigid things in comparison with nature's elastic methods of dividing up the surface of the globe to best suit its own interests. Life in nature rebels against being hedged in by lines of latitude and longitude, and insect life particularly. Many interesting questions are started by such a departure from the ordinary routine of human observation and experience. Missouri is a long way from here. Did that specimen come direct from there to here? It seems very

unlikely. Did it get here by shortened stages and lengthened time through several generations? That starts the question of food plant, what it is, and can it be obtained between there and here? Latitude might thus arrest its progress, at least its permanent progression that way. I have often wondered why insects, which I have every reason to believe were in a locality, could not be got; and am impressed with the idea that there must be many in a locality where one is got, and that some may be in localities where none have yet been seen; and when one is taken in such localities we are apt to conclude that it is the only one that ever was there.

It was in the autumn of 1881 that I took my first specimen of *Heliothis armiger* at Hamilton. An. Rep. Ent. Soc. of Ont., 1881, p. 30. And Dr. Saunders, then of London, now of Ottawa, assured me that up to that time he had not taken it. It was considered then to be but a transient visitor; now it could be taken here in numbers every season, although reported as injuring corn for the first time last season—a good illustration of how a migrant establishes itself in a new locality where its favorite food plant is easily obtainable. And others may be doing the same, of whose presence we have as yet had no indication.

The other species new to the Society's collection of that sending were:

Bryophila teratophora, H. S.
Manestra anguina, Grote.
Schinia trifascia, Hub.
Galgula subpartita, Guen.

J. Alston Moffat, London, Ont.

As a postscript to the above, I will now notice another of Mr. Bice's rare finds. Amongst the *Hydræcia* sent to me by Mr. H. Bird, Rye, N. Y., was a handsome specimen of H. Necopina, Grote, which Mr. Bird said was considered by many to be a mythical species until he discovered its food plant, and secured it in sufficient numbers to distribute freely. Mr. Bice called and saw the specimens; looked at them long and intently; pondered much, but said little. He went home and turned over his more recent captures, called a few days later with a box in his hand, which I took and opened; and there, to my surprise and delight, was a Necopina; lacking the lustre of the other, but quite unmistakable. Mr. Bird's specimen recalled something he remembered taking, but said nothing about it until he should see, for fear he might be mistaken.

J. A. M.

NOTES ON THE AMERICAN FORMS OF EUCHLOE, HÜBN.

BY A. G. BUTLER, PH. D., BRITISH MUSEUM, LONDON, ENGLAND.

Dr. Beutenmüller, in his recent revision of the species of *Euchloe*, notes the fact that the neuration of this genus is variable, but he appears not to have been aware that the variation is so frequent that no division of the genus based thereupon has any value. In his three groups, *Euchloe*, *Midea* and *Anthocharis*, there are not only species differing in the number of veins in the primaries, but individuals of the same species differ in the same way.

Another point in Dr. Beutenmüller's definition of his groups requires consideration : he speaks of vein 9 as being present or absent, whereas a careful examination of the position of the veins must make it evident that vein 9 is never absent, but that veins 7 and 8 frequently coalesce or are conterminous. This is quite certain, from the fact that in all species which normally possess 11 veins only in the primaries, the twelfth vein occurs abnormally as a furcation of vein 7 : thus, in *Midea lanceolata*, which usually has only eleven veins, vein 7 is sometimes forked near the distal extremity, though with a shorter fork than is usually seen in *Euchloe Sara* ; nevertheless, some examples of the latter, and particularly in the smaller varieties, *E. Reakirtii* and *Julia*, have only 11 veins.

Dr. Beutenmüller places *E. pima* and *E. methura* under *Midea*, although, excepting in the absence of the fork to vein 7 (or, in other words, in the absence of vein 8), they agree far more closely with the species of *Zegris*.

Some of the white species of *Euchloe* have 11 and others have 12 veins to the primaries, whilst the second subcostal branch (vein 10) varies considerably in its position in the same species, being emitted before, at or after the end of the discoidal cell.

As regards *E. creusa*, I believe it to vary seasonally as much as its very close ally, *E. ausonia;* the attempt to distinguish between *E. ausonides* and *E. hyantis* looks to me like a failure, not that they cannot be readily distinguished by size, form of secondaries, depth of ground-tint, and size of white spots on under surface, but because these differences are also to be seen in undoubted seasonal variations of the European form, *E. ausonia*, and because if *E. ausonides* is distinct from *E. hyantis*, the Vancouver form, which differs in the pattern of the under surface, has an equal claim to separation. As regards typical *E. creusa*, which Dr. Beutenmüller considers to be *E. hyantis*, I can definitely assure him that the type (which we possess) agrees with his *var. elsa*.

My idea of this species is that it can be arbitrarily sorted out into seven graded forms : *E. ausonides*, *E. var.* from Vancouver, *E. hyantis*, *E. lotta*, *E. coloradensis*, *E. creusa* = *elsa*.

Euchloe olympia is undoubtedly a species of *Zegris*.

BOOK NOTICE.

THE BUTTERFLY BOOK.—A popular Guide to a knowledge of the Butterflies of North America. By W. J. Holland, D. D., Chancellor of the Western University of Pennsylvania, etc., Pittsburg, Pa.: 1 vol., 4to., pp. 382.

[Price, $3.00, postage prepaid. Copies may be procured from the author, or William Briggs, 29–33 Richmond Street West, Toronto.]

It is with great pleasure that we announce the publication of this beautiful popular work on the Butterflies of North America. Hitherto the vast number of young people who begin collecting insects have had their enthusiasm sorely chilled by their inability to find names for their specimens, and have in consequence soon given up the pursuit in despair. Now there need be no difficulty as far as the butterflies are concerned. In the handsome volume before us there are no less than forty-eight beautiful coloured plates, produced by a new process from photographic representations of specimens from the author's cabinets, and on them are depicted over a thousand butterflies, belonging to 527 species. The colours are remarkably true to nature, and a child should have no difficulty in identifying any specimen that he may capture from the plates alone. In the letterpress brief descriptions are given, first of the characteristics of the genus in all its stages, with a wood-cut showing the neuration, and then of each species, setting forth the colours and markings, size, etc., of the butterfly, the early stages where known, and the geographical distribution; references are also given to the works of Edwards, Scudder, and other authors, where fuller information can be obtained. As an introduction to the work, illustrated chapters describe in a popular and interesting manner the life-history and anatomy of butterflies, how to capture, prepare and preserve specimens, their classification and the principal books that have been published upon them in North America. Interspersed through the volume are short papers, for the most part of an amusing character, in which the author varies the monotony of descriptive matter by telling some of his experiences or relating some interesting facts regarding these beautiful creatures. We heartily commend the work to our readers, and earnestly hope that it may become widely distributed amongst all lovers of nature throughout North America.

Mailed January 18th, 1899.



WILLIAM HAGUE HARRINGTON, F. R. S. C.

PRESIDENT OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO, 1893-5.

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THE COLEOPTERA OF CANADA.

BY H. F. WICKHAM, IOWA CITY, IOWA.

XXX. The Lucanidæ of Ontario and Quebec.

This family is of small extent, and the members are as a rule easily recognized by their peculiar habitus. In the genera *Lucanus*, *Dorcus*, *Platycerus* and *Ceruchus* the males are marked by a greater development of the mandibles, associated in turn with a greater or less broadening of the head. The antennæ differ from those of the Scarabæidæ (to which family the Lucanidæ are closely allied) in not having the plates of the club completely opposable. In other words, the club is pectinate rather than lamellate. These organs offer a good character for the division of the family into two divisions—the first containing those genera in which the antennæ are geniculate (*i. e.*, crooked like a bent knee, the second and following joints forming an angle with the first, as shown in the figure of *Lucanus dama*, fig. 12), while the second is composed of those in which they are straight. The male antennæ frequently differ from those of the female, but it is not necessary to enter into details for the purpose of this paper.

So far as known, the larvæ of the North American species are lignivorous, feeding upon dead wood in various stages of decay. They resemble in general form those of the larger Scarabæidæ, and may often be seen under logs in the woods. Some of them construct a cocoon of chips before passing into the pupal state. (Fig. 11 represents the larva and cocoon of *Lucanus dama.*)

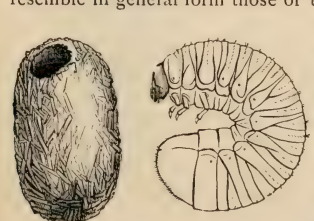


FIG. 11

The genera found in our region may be separated by the following table, which is but slightly changed from that of Mr. Chas. Fuchs in his synopsis of the family :

A. Antennæ geniculate.
b. Elytra smooth or nearly so.....*Lucanus.*
bb. Elytra striate and punctate (obsoletely in one case).
c. Eyes strongly notched by the margin of the head. Larger species.....*Dorcus.*
cc. Eyes entire or nearly so.....*Platycerus.*
AA. Antennæ straight *(i. e.*, not geniculate).
Smaller species. Front of head simply excavated or with a depression.....*Ceruchus.*
Larger species. Front of head with a short bent horn, pointing forward.....*Passalus.*

Further remarks on structural characters will be found under the head of each genus. The specific differences indicated are in the main those used by Mr. Fuchs in the paper above mentioned. *Nicagus* is omitted, for though the genus is now included in the Lucanidæ, the single Canadian species, *N. obscurus*, was treated of under the Scarabæidæ in CAN. ENT., Vol. XXVI., p. 206. It is entirely different in appearance from the other Canadian Lucanids, looking, as Dr. Leconte has said, like some of the Sericæ or a nearly smooth *Trox*.

LUCANUS, Linn.

Contains two Canadian species. They are large brownish beetles of shining surface, with very prominent mandibles, which are most strongly developed in the males. The tibiæ are armed externally with large teeth, but are without the finer serrations seen in the following genus.

Femora yellowish or very light brown. Mandibles with but one tooth internally. Head of well-developed male broader than prothorax. .92–1.40 in.....*dama*, Thunb.

Femora dark brown or nearly black, not lighter than the rest of the leg. Mandibles straighter, with several teeth in the male, two ill-defined ones in the female. Head narrower than prothorax. Punctuation of upper surface of body better defined than in the preceding .96–1.40 in.....*placidus*, Say.

Fig. 12 represents *L. dama*.

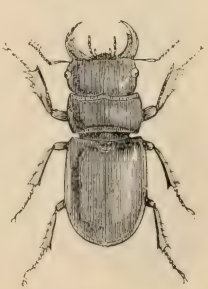


FIG. 12.

DORCUS, MacL.

Somewhat like *Lucanus*, but the species are rather smaller, and the teeth on the front tibiæ are less pronounced, becoming mere serrations on the proximal portion. *D. parallelus*, Say, is dark brown, nearly black, the head and thorax shining, with fine sparse punctures. Elytra distinctly striate, the striæ and interstitial spaces both evidently and rather closely punctured. In the males the head is nearly as broad as the thorax, and the mandibles have an enormous median tooth, which points obliquely inward and upward. Length, .60–1.04 in. The form called *brevis*, Say (fig. 13, after Packard), is smoother, and the head and thorax are much more developed. This variety is rare, and I have never seen it.



FIG. 13.

PLATYCERUS, Geoff.

These are much smaller insects than those belonging to the foregoing genera. The eyes are nearly entire instead of being notched in front by the encroachment of the sharp side margin of the head, and the anterior tibiæ are armed externally with numerous fine sawlike teeth. The mandibles of the males have an upward inclination and are larger than those of the females.

Sides of prothorax rounded, hind angles rather obtuse or rounded.

Brownish, greenish or bluish, shining, elytral striæ less deep. .40–.48 in. *quercus*, Web.

Sides of prothorax quite distinctly angulate near the middle, hind angles rectangular, distinct. Blackish, often with slight metallic reflections. Elytral striæ deeper, surface less shining. .44–.53 in. *depressus*, Lec.

In the Pacific provinces other species are found. *P. oregonensis*, Westw., is known from Vancouver Island. It is of a bluish colour, and looks something like *depressus* as far as form is concerned, but may be at once distinguished from that species by having the sides of the thorax straighter in the male and the hind angles obtuse or indistinct. It is of the same size as *depressus*. *P. Keeni*, Casey, from the Queen Charlotte Islands, was described in the CAN. ENT., Vol. XXVII., p. 153, so it is not worth while to repeat the characters here. It is .50 inch long, stouter than *oregonensis*, the elytra subcostulate and the legs very thick. The type was of a blackish-castaneous colour.

CERUCHUS, MacL.

C. piceus, Web., is the only representative in the east, but two others occur in the Pacific provinces, so that they are all included in the table. They are more convex insects than *Platycerus*, highly polished and shining. In colour all are brown. The males have the mandibles highly developed, and with an enormous median internal tooth. The head is also much broader in that sex, and bears a deep frontal excavation.

Elytra striate only on the disk. Striæ fine, intervals very strongly punctate. .52 in.....*punctatus*, Lec.

Elytra striate on disk and sides.

Striæ deep, coarsely, strongly punctured. .64–.68 in..*striatus*, Lec.

Striæ shallower, more sparsely and less deeply punctured. (Fig. 14.) .40–.60 in.....*piceus*, Web.



FIG. 14.

Both *punctatus* and *striatus* are known from Vancouver Island, where I got them in 1889. In the same region occurs *Sinodendron rugosum*, Mann., which belongs to the division of the family with straight antennæ, but may at once be distinguished from its neighbors by the fact that the clypeus bears a recurved horn, much longer in the males. In this sex the thorax is higher and sharply declivous anteriorly. The form of body is more cylindrical than any of our other Lucanidæ, while the sculpture is extremely coarse, the thorax being very coarsely confluently punctured, becoming rugose in the females. The elytra are striate, but the lines are fine and almost effaced by large punctures. Length, .44–.72 in. A male is shown in fig. 15.



FIG. 15.

PASSALUS, Fabr.

This genus is represented only by *Passalus cornutus*, Fabr., which must be rather rare in Canada, though common farther south. It is a very thick-set, heavy, shining brown beetle, 1.24 to 1.64 inch. in length, parallel-sided, the prothorax quadrate, about as broad as the elytra and with a distinct median groove. The head is narrower, without great mandibular development, but bearing a curious horn, which has the tip bent forward. The antennæ are stout, pubescent, and while not geniculate, seem to lie in a curve with the hollow anteriorly so as to give something of the same optical effect. The elytra are deeply striate, the striæ very finely punctured at bottom. A slightly reduced representation is shown by fig. 16.



FIG. 16.

I know of but one paper treating synoptically of the North American species.

1882. Fuchs, Chas. Synopsis of the Lucanidæ of the U. S. Bulletin Brooklyn Ento. Soc., V.

Capt. Thos. L. Casey has described a number of new species of *Platycerus* in various publications, but has not tabulated the genus.

A NEW SPECIES OF ASTEROSCOPUS, Bd.

BY JOHN B. SMITH, SC. D., RUTGERS COLLEGE, N. J.

Lederer characterizes *Asteroscopus* essentially as follows: Narrow-winged owlets, resembling Bombycids in the shaggy, loose vestiture. Palpi short, not exceeding the front, drooping. Tongue short and weak. Eyes naked, with bristly lashes. Antennæ comparatively long, with a tuft of hair at the base; in the male with short pectinations to the tip; in the female with sharp, ciliated angles to each joint. Thorax broad, convex, clothed with long, woolly hair. Abdomen shaggy, untufted. Body beneath and legs with dense woolly vestiture. Legs short, anterior tibia with a long claw at the tip.

The caterpillars are naked, considerably enlarged posteriorly, green, with a pale lateral stripe, and have an abrupt declivity or step on the last segment. They feed on various deciduous trees, and when at rest elevate the anterior segments as do some of the Notodonts. They pupate underground and remain unchanged an unusually long time.

Heretofore no species properly referable to this genus has been described from our fauna. The *A. barometricus* of Goossens, Le Nat. III., 380, is simply a redescription of *Ufeus plicatus*, Grt. Every structural character given by Goossens contradicts the description of the genus to which he refers his species and agrees with those of *Ufeus*.

A species properly referable to this genus was taken by Mr. E. F. Heath, sent to Dr. Dyar for determination, and by him referred to me. I characterize it as follows:

Asteroscopus borealis, n. sp.

Ground colour a dark ashen gray, powdered with black, hairlike scales, which gives the insect a sordid, smoky appearance. Head and thorax perhaps a trifle darker than the wings, the head much retracted. Abdomen with somewhat finer vestiture, which show a tendency to a mouse-gray tint. Antennæ of the male yellowish-brown, distinctly but not lengthily pectinated, and with a tuft of creamy hair at the base.

Primaries with all the veins black marked, giving the insect a somewhat strigate appearance. No basal line. T. a. line single, broad, diffuse, outwardly bent so as to form almost a right angle in the submedian interspace. T. p. line single, blackish, shortly dentate on the veins, starting from the costa over the reniform, bent outwardly far beyond the cell, then almost parallel with and rather close to the outer margin, to the inner margin. There is no s. t. line and there are no terminal dots; but the fringes are cut with triangular black dashes, the apices of which rest on the middle of the interspaces. There is a vague series of oval, darker shades in the interspaces beyond the t. p. line. A median blackish shade starts obliquely from the middle of the costa, reaches the median vein at the bottom of the reniform, and is then discontinued. The reniform is large, irregular, of the ground colour, outlined by a diffuse blackish line. Orbicular very long and narrow, decumbent, scarcely defined, reaching from the t. a. line almost to the reniform. Claviform distinct, narrow, extending almost to the middle of the wing, outlined in diffuse blackish.

Secondaries, smoky over whitish, powdery, the apex and margin paler. Fringes whitish. Veins dusky. A series of blackish, somewhat undefined terminal spots in the interspaces. Discal spot of the under side showing through the wing.

Beneath, primaries smoky, powdery, shading to almost white toward the outer margin, which is marked by a broken terminal line and small, interspaceal black dots. The reniform appears here as a darker smoky shading, and the course of the t. p. line is marked by a diffuse smoky shade which disappears before it reaches the inner margin. Secondaries white, shaded with smoky along the costal and inner margins. Veins marked with blackish. A series of smoky terminal spots in the interspaces. A large blackish discal lunule, from which a black line extends to the base through the middle of the median cell.

Expands 2 inches = 50 mm.

Habitat: Cartwright, Manitoba.

A single male specimen, donated by Mr. Heath to the U. S. National Museum, where it is marked Type 4107 !

The species should be an easily recognizable one, not only from the generic characters, but from the distinct bombyciform appearance and the quite striking maculation of the under side. The nearest approach to this occurs in *Rancora*, next to which the present genus and species may be placed in the series.

DESCRIPTION OF LARVA OF INGURA DELINEATA, Guen.

BY HARRISON G. DYAR, WASHINGTON, D. C.

I have named my specimens in accordance with the material in the National Museum, arranged by Prof. Smith. The result is unsatisfactory, because this is the gum-tree larva described by Edwards and Elliot as *I. præpilata*, Grt. (Papilio III., 135). The larva mentioned in Guenée as *delineata* has a different food plant. There is evidently some confusion here, which must be adjusted by the next monographer of the genus.

Egg.—Low and flat, domed, like Apatela, the edges wavy, thin and flat. Surface smooth, with numerous rows of little elongated beads radiating regularly from the micropyle, reaching the number of about 160 around the margin. The points of increase are not perceptible, as the surface is entirely flat, without ribs, and the beads not contiguous. Transparent, colourless, green from the leaf showing through. Diameter 1.2, height .2 mm.

Stage I.—Head bilobed, long, shining pale brownish; width .3 mm. Body slender, translucent ochreous-yellow; setæ normal, long, stiff, brownish, arising from small rounded brown tubercles. Tubercle iv. is behind the spiracle about equidistant between iii. and v.; vi. not present. Feet normal; no markings.

Stage II.—Head whitish-yellow; width .45 mm. Body slender, anal feet stretched out behind, thorax a little enlarged. Pale yellowish, rather translucent, the food showing green, darkest in the thorax. Skin a little shining, smooth, the segmental incisures of joints 4 to 11 very well marked. Setæ five, rather long; tubercles obsolete.

Stage III.—Head translucent, pale yellow; width .8 mm. Slender, smooth as before, but the incisures of joints 5 to 11 folded and marked in pale yellowish pigment, giving six faint, transverse intersegmental bands. Four tubercles on the anterior edge of cervical shield are minutely black. No other marks. Setæ smaller than before, except at the ends.

Stage IV.—Less slender, thicker and a little flattened, tapering behind; width of head 1.2 mm. Translucent green, head slightly whitish; intersegmental bands supplemented by a broken subdorsal, and continuous, straight stigmatal line, pale yellow, the subdorsal consisting of a dot behind tubercle ii. and a dash below it, distinct except on the thorax. Blood somewhat green; setæ pale; feet slender.

Stage V.—Head dull yellowish, translucent; width 1.9 mm. Body green, marked with opaque yellow; twelve short, transverse, intersegmental, dorsal bands, reaching below the level of wart ii., that between joints 13–14 broken into three dots. Many irregular dots, about nine on each side above the straight, narrow superstigmatal line, and nine below it, none on the tubercles, which are concolorous or brownish (iii. to v. are brown); four black tubercles on anterior edge of cervical shield. A yellow line on the divergent anal feet. Tubercle iv. at the lower edge of spiracle.

Stage VI.—Head retracted at apex under joint 2; dull yellowish; width 2.5 mm. Body thick and flat, joints 11 to 13 tapering, anal feet outstretched backward, all the feet with long claspers, slender, normal. Yellow-green, clear, but not translucent, the light yellow marks as before, but the dorsal transverse bands shorter (just below tubercle ii.), except the broken one between joints 13 and 14, which almost touches the stigmatal line; dots more numerous (about 12 to 18 instead of nine in each space), some irregular. No black dots on cervical shield. These have suddenly disappeared; spiracles brown, just below the narrow superstigmatal line; cervical shield and anal plate with a yellow edge. Setæ pale, long subventrally; tubercles obsolete, not coloured, iv. opposite lower edge of spiracle. Feet pale whitish, dorsal vessel dark. Length 23 mm. The larva sits flatly on the back of the leaf.

At the end of this stage the larvæ spun cocoons of white silk between partly bitten up leaves. Imago in about three weeks.

Found on gum tree *(Liquidambar)* at Glendale, L. I.; also at Morris Plains, N. J.

A PROLONGED SEASON OF OCCURRENCE FOR SCHISTOCERCA AMERICANA.

At Wooster, Ohio, this species was observed in the fields on May 26, and at Alliance, nearly due east, on October 24, while at Bridgeport, in the extreme eastern central part of the State, it was found, active, on November 4, all during 1898. It appears to have been more numerous of late in the vicinity of the south shore of Lake Erie than elsewhere in the northern portion of the State, and more abundant than I have formerly observed it in the same latitude in Indiana and Illinois.

F. M. Webster.

NOTES ON SOME ONTARIO ACRIDIIDÆ.—Part III.

BY E. M. WALKER, TORONTO.

(Continued from Vol. XXX., page 263.)

IV.—Acridiinæ.

20. Schistocerca americana, Drury.

Gryllus americanus, Drury. Illustr. Nat. Hist., app. (1773).

Acridium americanum, Scudd. Mat. Mon. N. A. Orth., 466 (1862).

Schistocerca americana, Blatchley. Can. Ent., XXIII., 79 (1891).

This large and beautiful locust has been twice reported from Ontario, at London (Can Ent., XXVII., p. 52), and at Toronto (Can. Ent., XXIX., p. 89), a single example being taken in each instance. These were probably wanderers from the South, certainly in the case of the Toronto specimen, and the insect can hardly be regarded as a native of our Province, though it may be established in the extreme southern portion.

21. Podisma variegata, Scudder.

Pezotettix glacialis, Comstock. Introd. Ent., 107 (1888).

Podisma variegata, Scudd. Revision of the Melanopli, from Proc. U. S. Nat. Mus., XX., 101 (1897).

I have taken this beautiful little species in two large swamps, one at De Grassi Pt., Lake Simcoe, and the other about six miles further west. Altogether I have taken sixteen specimens, eight ♂ s and eight ♀ s, six from De Grassi Pt. and ten from the other spot. Dr. Brodie has also taken it at Muskoka, where he found it in considerable numbers. The only other localities where it has been found are Ithaca and Enfield Falls, Tomkins Co., N. Y. (Scudd. Rev. Melanopli, p. 102).

It can be at once distinguished from all our other Acridiidæ, except its ally, P. glacialis, Scudd., by its having no trace of either tegmina or wings. The latter species, which is not uncommon in the White Mountains, N. H., has been taken at Sudbury, Ont., by Dr. Scudder (Rev. Melanopli, p. 100), but is not found with us at the south, being, like most of the genus, a species which affects high altitudes or latitudes. It differs from P. variegata mainly in the shorter hind legs and antennæ, the stouter cerci, and the almost uniformly green hind femora, those of P. variegata being pale yellowish, thrice banded with dark brown.

The two swamps where I secured my specimens are quite similar in character. They are for the most part densely wooded with a mixed growth of arbor-vitæ, tamarack, balsam fir, and spruce, with raspberry

bushes, *Eupatorium purpureum* and *perfoliatum*, and many other plants in less abundance growing in the sunny openings. In the wetter parts of the swamps, where tamarack is almost the only tree to be found, I have never seen *P. variegata*, which seems, indeed, to be the most particular about its haunts of any of our Acridians.

They are generally seen sunning themselves on the leaves of shrubs, sometimes close to the ground, though more often three or four feet above it. Most of my specimens were taken from the leaves of the red raspberry *(Rubus strigosus)*, one from Labrador Tea *(Ledum grœnlandicum)*, others from the branches and trunk of arbor-vitæ *(Thuja occidentalis)*. I found a dead and decayed male clinging to a raspberry twig. It had evidently been the victim of some fungus like that which infests the common two-striped locust *(Melanoplus femoratus)*.

Besides the mature specimens, I have also a female nymph, which resembles the adult much more closely than do those of Melanoplus, the colour and markings being quite similar to those of the adult.

It is a late appearing insect, all but three of my specimens having been taken in September. One of these three, my first capture of the species, is dated Aug. 6, 1895, and the other two Aug. 23, 1867. I do not know how late they remain, as I always leave De Grassi Pt. before the end of September, at the time when they are most easily obtained.

22. Melanoplus atlanis, Riley.

Caloptenus atlanis, Riley. Ann. Rep. Ins. Mo., VII., 169 (1875).
Caloptenus atlantis, Thos. Bull. Ill. Mus. Nat. Hist., I., 68 (1876).
Melanoplus atlanis, Scudd. Rep. U. S. Ent. Comm., II., app., 24 (1881).

This is one of our commonest grasshoppers, doubtless occurring in all parts of the Province. It appears earlier than most of our Melanopli, and continues until late in the fall. In the season of 1898 I saw a number of adults on June 16th, though they are not usually seen until about a week later. It is to be found mostly on sandy soil, often in immense numbers, and is our most destructive locust.

I have specimens from Rat Portage, Aug. 28, 1897; Nepigon, Aug. 27, 1897; Severn River, Aug. 17, 1898; Lake Simcoe, and Toronto. Along the Severn River they were not nearly so common as one would have expected, from the sandy and rocky character of much of the country, M. collinus far exceeding it in numbers.

All my specimens have the typical red hind tibiæ, nor have I ever noticed a specimen with tibiæ glaucous or otherwise differently coloured,

23. Melanoplus Dawsoni, Scudder.

Pezotettix Dawsoni, Scudd. Daws. Rep. Geol. and Res. 49th Par., 343, (1875). CAN. ENT., XII., 75 (1880).

Pezotettix tellustris, Scudd. Ann. Rep. Chief Eng., 502 (1876). CAN. ENT., XII., 75 (1880).

Pezotettix abditum, Dodge. CAN. ENT., IX., 113 (1877).

Melanoplus Dawsoni, Scudd. Rev. Melanopli, 227 (1897).

This little species is not uncommon near Toronto in certain parts of High Park and the adjoining country. Here it frequents dry sandy soil, generally somewhat bushy or scrubby, but it also occurs in open sandy fields. I also found it quite common at Macdonald's Falls, Severn River, in a sandy and somewhat hilly district, thinly wooded with oak and white pine, with a scattered undergrowth of blueberry bushes *(Vaccinium)*, New Jersey Tea *(Ceanothus americana)*, Sweet-fern *(Comptonia asplenifolia)*, and many other shrubs; the vegetation closely resembling that of the drier parts of High Park, where *M. Dawsoni* occurs.

Dr. Scudder, who kindly determined this species for me, says he has never before seen a specimen taken east of Iowa and Minnesota. I have also found it very common on the prairies of Manitoba.

The specimens from the Severn were taken on Aug. 25th, 1898, while those from Toronto were all taken during September, as I am always away from the city during the summer months. They remain until the beginning of October.

24. Melanoplus islandicus, Blatchley.

Melanoplus islandicus, Blatchley. Psyche, VIII., 196 (1898).

Melanoplus abortivus, E. M. Walker. CAN. ENT., XXX., 90 (1898).

Since my description of this species was published I have taken it in a few new localities which somewhat widen its known range. On July 15, 1898, I found a few specimens in a low, rich wood, a few miles north of Toronto, and on Aug. 8 I found it in a similar wood on the banks of the Severn, near Sparrow Lake, and at several other spots along the river as far as Gloucester Pool, near Georgian Bay. In most of these spots it was met with in moderate numbers, being about as common as it is at Lake Simcoe.

25. Melanoplus fasciatus, Walker.

Pezotettix borealis, Scudd. Can. Nat., VII., 286 (1868).

Acridium fasciatum, Barnston. Ms. Walk. Cat. Dermapt. Salt. Brit. Mus., IV., 680 (1870).

Caloptenus fasciatus, Walk. Cat. Dermapt. Salt. Brit. Mus., IV., 680 (1870); CAN. ENT., IV., 30 (1872).

Melanoplus rectus, Scudd. Proc. Bost. Soc. Nat. Hist., XIX., 284 (1878).

Melanoplus fasciatus, Caulfield. Rep. Ent. Soc. Ont., XVIII., 71 (1886).

Pezotettix septentrionalis, Morse. Psyche VII., 53 (1894).

The short-winged form (*curtus*, Scudd.) of this species is tolerably common in Ontario in dry open woods, preferably on sandy or rocky soil. It is frequently associated with *Chloealtis conspersa*, and sometimes with *M. islandicus*, though the latter usually prefers damper, richer, and shadier haunts than *M. fasciatus*. While generally fairly numerous where it occurs, it is never very abundant.

I have a single ♀ of the long-winged form (*volaticus*, Scudd.), taken at De Grassi Pt., and hitherto only known from Michigan.

My specimens, taken between June 24th and Aug. 17 (though they are certainly to be found later than this), are from Toronto and neighboring localities, De Grassi Pt., Stony Lake, Peterborough Co., and various points along the Severn River.

26. Melanoplus femur-rubrum, DeGeer.

Acridium femur-rubrum, DeG. Mém. Hist. Ins., III., 498 (1773).

Caloptenus femur-rubrum, Burm. Handb. Entom., II., 638 (1838).

Melanoplus femur-rubrum, Scudd. Hitchc. Rep. Geol. N. H., I., 375 (1874).

This extremely common species occurs throughout the settled parts of Ontario, frequenting every field and roadside during late summer and autumn. It seems to be most abundant in the southern part of the Province, but is plentiful enough in the north in beaver-meadows and wherever there is a rank, luxuriant vegetation. The specimens found in these wild places are apt to be more brightly coloured than those of the fields and roadsides.

They usually make their first appearance with wings towards the end of July, but I have three males from De Grassi Pt. dated July 2, 1896, an unusually early record. They remain later in the fall than any other species, being often seen in sunny, sheltered spots as late as the first week in November.

Melanoplus extremus, Walk., an allied species, will in all probability be met with in Northern Ontario, as it has been reported from most of the Northern United States, from Quebec, and various parts of arctic and sub-arctic Canada.

27. Melanoplus minor, Scudder.

Caloptenus minor, Scudd. Proc. Bost. Soc. Nat. Hist., XVII., 478 (1875).

Melanoplus minor, Scudd. Cent. Orth., 84 (1879).

I have found this insect in considerable numbers in the sandy tract of land between Toronto and the Humber River. It frequents dry grassy fields and sandy, bushy or thinly-wooded country.

In most of the specimens from this locality the hind tibiæ are bluish-green, though they may vary from a "robin's egg" blue to almost colourless or pale pink. Males with pink tibiæ are seldom seen, these being nearly always bluish-green or blue, or sometimes nearly colourless. Of the females, about 25% have pink tibiæ, and in about as many they are glaucous or grayish.

The adults appear much earlier than any other species of Melanoplus found in Ontario, usually in early June. I took several ♂'s on the 30th of May, 1896; but these were all rather soft, evidently having been full-fledged but a short time. I have never remained in the city long enough in the summer months to ascertain how long in the season they remain, the latest date upon which I have taken a specimen being July 21, when they were still fresh and moderately plentiful.

28. Melanoplus collinus, Scudder.

Melanoplus collinus, Scudd. Proc. Bost. Soc. Nat. Hist., XIX., 285 (1878).

This dark-coloured locust is quite plentiful in Ontario in late summer, although this is the first time it has been recorded from Canada.

It frequents sandy or gravelly uplands, more or less open, or rocky, unsettled country, such as characterizes the Laurentian area in Ontario. During August, 1898, I found this locust extremely common along the Severn River, which flows from Lake Couchiching, at the north end of Lake Simcoe, to Georgian Bay through a somewhat hilly region of gneiss and granite, near the southern boundary of the Laurentian area. Here it was decidedly the most abundant grasshopper, far outnumbering any other *Melanoplus*, and flew about the rocks and scanty soil in large numbers. The specimens seen in this locality showed a wider range of

colour variation than those found in the fields and pastures about Toronto and De Grassi Pt. In some the contrast between the light and dark marking is very great, in others the colours are almost suffused with blackish.

This species is common, locally, at Toronto and Lake Simcoe, but is less so than on the Severn River. I have also taken a male at Hawk Lake, on the C. P. R., north of Lake Superior. In this specimen the contrast in the markings is as great as in any specimen I have seen. This latter locality is the most northern from which it has been recorded.

This is one of our late-appearing species, not usually being seen before August. I have one ♀, however, taken July 2nd, 1896, more than a month earlier than it is usually seen. My other specimens are dated from Aug. 11 to Sept. 28, though it can be taken several weeks later than this.

29. Melanoplus femoratus, Burmeister.

Caloptenus femoratus, Burm. Handb. Ent., II., 638 (1838).

Acridium flavo-vittatum, Harr. Ins. Inj. Veg., 140 (1841–42).

Caloptenus bivittatus, Uhler (pars). Say. Ent. N. A., ed. Lec., II., 238 (1859).

Melanoplus bivittatus, Scudd. (pars). Hitchc. Rep. Geol. N. H., I., 376 (1874).

Melanoplus bivittatus, var. femoratus, Morse. List of N. E. Acrid., Psyche, VII., 106 (1894).

Melanoplus femoratus, Scudd. Proc. Bost. Soc. Nat. Hist., XIX., 285 (1878).

This large, robust locust is so well known throughout Ontario that it need only be mentioned. I have found it in every part of Ontario where I have done any collecting. Though often seen on our roadsides, it prefers places where there is an abundance of rank grass and luxuriant vegetation, such as wet meadows and open marshes. I have often found it on old lumber-roads through swampy woods, and in natural openings in them.

My specimens are dated from June 26 to Sept. 28, but I have seen worn specimens in early October.

30. Melanoplus punctulatus, Uhler.

Caloptenus punctulatus, Uhler. Ms. Scudd., Bost. Journ. Nat. Hist., VII., 465 (1862).

Caloptenus griseus, Thos. Ann. Rep. U. S. Geol. Surv. Terr., V., 454 (1872); Bruner, Can. Ent., IX., 144 (1877).

Melanoplus punctulatus, Scudd. Hitchc. Rep. Geol. N. H., I., 376 (1874).

Melanoplus griseus, Blatchley. CAN. ENT., XXIV., 30, 31 (1892).

This interesting species is occasionally met with in Ontario, but is one of our rarest Acridians. During the last four years I have not seen on an average one specimen during a season. During 1892 and 1893 they were more numerous, but since I was not specially interested in Orthoptera at that time, not many were taken. In all I have taken but nine specimens, all of which are females. I think it likely that the species will prove to be commoner when I have ascertained its exact habitat, nearly all my specimens having been taken accidentally. They were mostly found on old wooden fences or tree trunks, on the borders of damp, shady coniferous woods. Two ♀s were taken on tamarack stumps in a swamp at De Grassi Pt. In every instance in which I have taken this insect further search has proved fruitless.

It is a very sluggish insect, with much shorter hind legs than any of our other Melanopli, and relies not so much upon these for protection as upon its mottled gray colours, which make it difficult to observe when squatting on an old lichen-covered fence or stump.

My specimens are dated from Aug. 2nd to Oct. 8th. This is the first time this species has been recorded from Canada.

APPENDIX.

Tryxalinæ.

5a. Chloealtis abdominalis, Thomas.

Chrysocraon abdominalis, Thos. Syn. Acrid, N. A., 74 (1873).

Chloealtis abdominalis, McNeill. Rev. Trux. N. A., in Proc. Davenport Acad. Nat. Sc., VI., 229 (1897).

During my canoe trip down the Severn River last summer I came across quite a number of what I took to be merely large specimens of *Chloealtis conspersa*, Harr. I noticed that the sides of the pronotum of the ♂s were not black like those of the ordinary *conspersa*, but it never occurred to me that it could be anything but a mere colour variation. Unfortunately, though they were not uncommon, only 3 ♂s and 2 ♀s were secured. When I returned to Toronto an examination of these

specimens proved that they were not *conspersa* at all, but agreed exactly with specimens of *C. abdominalis*, which I took during the summer of 1897 at Banff, in the Rocky Mountains, and in the Province of Manitoba, except that the tegmina are a little longer, especially in one of the ♀s, in which they are nearly twice the length of the pronotum, while in the Western specimens they are only very slightly longer than the pronotum. In the other ♀ from the Severn they are only about one-fourth as long again as the pronotum.

C. abdominalis is easily distinguished from *C. conspersa* not only by the greater size and the paler sides of the pronotum in the ♂, but also by the more arcuate lateral carinæ, especially in the ♀. Very few *conspersa* were seen during my canoe trip.

My specimens are dated Aug. 15 and 18, 1898. This is the first time it has been recorded from Canada, and the first time east of Dakota.

Encoptolophus sordidus, Burm.—This species was quite common at Toronto last fall, and during a bicycle trip along the lakeshore I found it gradually increasing in numbers as I rode to Hamilton and Niagara Falls.

Scirtetica marmorata, Harris.—I found this beautiful locust exceedingly numerous last summer all along the Severn River, in many places being even more abundant than *Circotettix verruculatus*. It flies about the bare gneiss and granite rocks and on the dry, scanty soil which partly covers them.

THE ODOUR OF COCCIDÆ.

Prof. Webster's interesting note on p. 4 leads me to offer a few remarks. The species of the sub-genus *Toumeyella* of *Lecanium* have quite a strong musky odour; but ordinarily I have been unable to detect any marked odour in species of Coccidæ. I suppose, however, that all possess some odour, and that its purpose is to attract the males to the females. This seems the more probable when we remember that in many species the male puparia are not on the same part of the plant as the females. Here at Mesilla Park, also, I have lately seen a male of *Margarodes hiemalis*, Ckll. ined., run over the ground until it detected a spot where a female was buried, and then dig down to the female. It must certainly have detected its mate by the sense of smell.

T. D. A. Cockerell.

COLLECTING NOTES ON KANSAS COLEOPTERA.

BY W. KNAUS, MCPHERSON, KS.

An experience of eighteen years in collecting Coleoptera in Kansas would naturally lead to the discovery of several good collecting grounds, and to many interesting observations on the abundance or scarcity of certain species for one or more years.

I have found my most interesting and profitable ground on the salt marshes or flats of Wilson County in South-eastern Kansas, and Republic and Mitchell Counties in North Central Kansas; in the valleys of the Verdigris River in Wilson County, of the Republican River in Jewell County, the Smoky Hill River in Wallace County, and the Arkansas River in Hamilton County; the two latter in extreme western Kansas.

I have also collected for years at the electric lights at McPherson. Another most interesting and profitable locality is in the sand hills twenty miles south-west of McPherson. In these sand hills I have taken during the past eight years *Cicindela scutellaris*, *formosa* and *venusta*, all beautiful species; *Stephanucha pilipennis*, Kraatz, one of the rarest Scarabeids; *Serica curvata*, Lec.; *Canthon nigricornis*, Say; *Ammodonus fossor*, Lec., and *Chalcodermus collaris*, Horn. I took from the electric lights last season for the first time a few specimens of *Stenomorphus rufipes*, Lec., a south-western species, but never recorded as taken in this State. McPherson is probably near its northern limit. I also took at the electric lights in June of last year for the first time, four specimens of *Lachnosterna spreta*, Lec., the first capture of this species in this State. Another rare species taken at the lights was *Lachnosterna Ulkei*, Smith, but only two or three specimens were captured. *Lachnosterna bipartita*, Horn, was taken in considerable numbers, both at the lights and in early evening flight. Another beetle taken sparingly at the electric lights in May and June was *Nothopus zabroides*, Lec.; this place is probably near its south-east limit. *Platynus Texanus*, Lec., also occurred sparingly at the lights for the past two years. Each year a few of the handsome *Eretes sticticus*, Linn., are also taken from the electric-light globes.

One of my most interesting collecting grounds is at the range of sand hills parallel to the Arkansas River in Reno County, and about eight miles north of the river. These hills or dunes are blown about by the wind, and in many places are excavated by the air currents to a depth of seventy-five to one hundred and fifty feet, and the fine white sand is

piled in huge dunes, usually north of the excavation. Visits to this region are made in May and June, and are usually well rewarded. The season of 1896 I took *Cicindela scutellaris*, Say, and *Cicindela formosa*, Say, in numbers, the former species being more abundant. I also take the beautiful *Cicindela venusta*, Lec., with the two preceding species, but less abundant; some seasons only a few specimens are taken.

Beginning with the collecting season of 1891, I have each year taken a few specimens, never more than six or eight in a season, of the rare *Stephanucha pilipennis*, Kraatz, first described in 1888 from Nebraska. I have taken it only from May 1st to May 20th, crawling sluggishly over the sand, and have found occasionally dead perfect specimens. Warm evenings, during the latter part of April, will probably furnish the best collecting results for this species. Another handsome and desirable insect taken in May and June in this locality is *Cremastochilus nitens*, Lec. During the warmer parts of the day it can be picked up from the bare sand, but during the hottest part of the day it must be handled quickly, as it becomes active and is a quick flier.

One of the best finds, *Ammodonus fossor*, was made in this locality May 16th, 1897. After collecting over the hills about three hours, I went up the side of the sand hill, about twenty feet from the bottom of a blow-out, and sat down to eat a lunch. I soon saw a small round *Tenebrionid* running over the sand, and captured it. It was difficult to see, as it was almost the exact colour of the sand, and only the closest observation would distinguish it from its surroundings. By digging out depressions left by cattle in passing over the sand, and examining the few plants growing around, I soon took twenty-two specimens from an area of ten feet square. Specimens were sent to Dr. Geo. H. Horn, of Philadelphia, and through his kindness and that of Mr. Chas. Liebeck, were identified as above. The species occurs in sandy locations in Maryland and New York, and in California and Arizona, although the specimens from the extreme west are of a larger size.

In this locality in 1891 I took *Chalcodermus collaris*, Horn, quite abundantly, but have not since seen a single specimen.

The valley of the Smoky Hill River at Wallace, Kansas, within twenty miles of the Colorado line, is an attractive locality for the collector of insects. The clay bluffs south of the Smoky furnish a home and feeding ground for the king of the *Cicindelidæ*, *Amblychila cylindriformis*, Say. Three short visits to this locality in as many years were rewarded

with the capture of a few specimens of this desirable insect. At rare seasons they are quite abundant, but usually only a few can be taken each night. Another desirable beetle I took by beating the willows on the banks of the Smoky was *Poecilonota thureura*, Say. *Calosoma obsoletum*, Say, is found in alfalfa fields and along old roads the latter part of July and during August. Beating thistles near Wallace resulted in the capture of eight or ten specimens of the rare *Clerus cordifer*, Lec. Under old cow chips near the bluffs were taken a number of the curious and sluggish *Ologlyptus anastomosis*, Say; also numbers of *Trimytis pruinosa*, Lec., and a few *Ophyrastes vittatus*, Say, were found under the same shelter.

Almost directly south of Wallace and distant about one hundred miles is Coolidge in the Arkansas Valley. I collected in this locality one day, July 7th, 1897. The general insect fauna is very similar to that at Wallace, although several species occur at Coolidge that are not taken at the former place. In an alfalfa field adjoining the town, from which the hay was being raked, I took a fine series of *Calosoma triste*, Lec. This species is evidently a variable one, as the elytra of one specimen will be almost smooth, while that of the next one taken would approach the sculptured markings of *obsoletum*.

From horse droppings I took a fine lot of *Canthon depressipennis*, Lec., and thistle heads disgorged *Euphoria Kernii*, Hald., and *inda*, Linn., in proportion of two of the latter to one of the former. But one specimen of the black variety of *Kernii* was taken. Beating vegetation alongside small rivulets and depressions in the prairie yielded numerous specimens of *Monoxia consputa*, Lec., and a few *Diabrotica tricincta*, Say. At Garden City, fifty miles east of Coolidge, a few minutes' beating of plants along the roadside yielded numerous specimens of *Copturus adspersus*, Lec.; *Anthonomus squamosus*, Lec., and *Smicronyx vestitus*, Lec.

The Verdigris Valley in Wilson County yielded a number of desirable things to the collector of Coleoptera. April 20th to 30th marks the appearance of *Lachnosterna calceata*, Lec., the most common Scarabeid in that region. In favored localities on still evenings they swarm over the tender shoots of the young oaks. By jarring these, dozens of the insects fall to the ground, and by the use of the lantern are easily picked up and transferred to the cyanide jar. Other *Lachnosternas* occurring at about this time are *Hornii*, Smith; *gibbosa*, Burm.; *crenulata*, Frch.; *vehemens*, Horn, and *crinita*, Burm. At about the same time, upon a

species of dock that grows over bottom land, can be taken numbers of the beautiful *Phytonomus eximius*, Lec. They are very shy and drop quickly to the ground on the first alarm. The open mouth of the cyanide bottle should be under them before the plant is touched. From the opening leaf-buds of the young hickories may be beaten *Conotrachelus nenuphar*, Herbst., and *affinis*, Boh., and the sap from stumps of freshly cut hickory trees attract numbers of *Colastus semitectus*, Say; *Soronia undulata*, Say; *Perthalycra Murrayi*, Horn; *Pocadius helvolus*, Er.; *Cryptarcha concinna*, Mels.,and *Bactridium striatum*,Lec. Under stones near the bluffs bordering the valley may be found rather sparingly *Pasimachus californicus*, Chd., and resting under the same shelter an occasional *Diplotaxis corvina*, Lec. While collecting over the tree-covered stony knoll near Benedict, in this County, in September, 1896, I took a single fresh specimen of *Nomaretus cavicollis*, Lec., the only specimen of this beautiful *Carabid* I ever took south of the Kansas River at Manhattan.

Collecting at Salina, Kansas, in 1884 and 1885, yielded a number of species of *Apions*, identified by Mr. H. C. Fall, of Pasadena, California. Among them were *Apion segnipes*, Say, rather common; *attennatum*, Smith; *griseum*, Smith; and *occidentale*, Fall, MS., occurred rarely, and are all new to the Kansas list. On the Kansas and Nebraska line, near Superior, Nebraska, the latter part of May, in 1895, I took *Apion minor*, Smith; *spinipes*, Fall, MS., and *Nebraskense*, Fall, MS., a few specimens of each. Near Rago, Kingman County, Kansas, August 15th, 1898, I took a half dozen specimens of *Apion modestum*, Smith, a species also new to the list of Kansas Coleoptera. In the same locality I took *Anthonomus moleculus*, Casey; *Orthoris Crotchii*, Lec., and *Pseudobaris farcta*, Lec.

Some seventy-five miles south-west of Rago, at Belvidere, Kansas, I took on August 16th numbers of *Plectrodera scalator*, Say. This handsome borer was easily taken about sunset on the leaves and twigs of young willows and cottonwoods. Other desirable species taken at this locality were *Lappus lividus*, Casey; *Mitostylus tenuis*, Lec.; *Anthonomus tectus*, Lec.; *Coeliodes asper*, Lec; *Zygogramma disrupta*, Rogers; *Zygogramma heterothecæ*, Linell.

Cicindela violacea, Fab., the beautiful blue or green tiger beetle, is taken in May or June in the wooded valleys of Eastern Kansas. I took two or three specimens near Benedict, in Wilson County, South-east Kansas, last season. Have never taken it west of Manhattan, at the junction of Big Blue and Kansas rivers.

DESCRIPTIONS OF SAWFLY LARVÆ.

BY CHESTER YOUNG, ELLENVILLE, N. Y.

Macroxyela ferruginea.—Larva is about 1.5 cm. long and caterpillar-like, green with yellowish-white markings, prolegs on every abdominal segment, anal area smooth and concolorous with the body, antennæ six jointed. Feeds on Ulmus americana.

Head green; antennæ green, except three brown distal joints and a brown ring around the middle of the second and third joints; mandibles rufous at the tips; ocelli black. Body green, with the following parts yellowish-white: two dorsal stripes, a substigmatal line extending along the substigmatal fold of skin from the head to about the third or fourth abdominal segment, and the tubercles; a ventral line of pearly white extending from head to 4th abdominal segment. Segments four annulated, with the tubercles on the normal abdominal segments arranged as follows: none on the first annulation, three on the second annulation, four on the third annulation, and three on the fourth annulation. They are arranged in three general transverse rows. The substigmatal fold of skin with many rudimentary tubercles; dorsal tubercles with many and lateral ones with few to no setæ; setæ very short; two conical projections, with many setæ just above the anus. Legs greenish-white, except for basal joint, which is concolorous with the body.

Cocoon a light shell of sand held together by a few strands of silk.

Larvæ sit curled around the young leaves or terminal buds with the front part of their body free. They feed by eating a line across the bunch of leaves, thus truncating them all. A single brood each year, the adults appearing in April. A few days before the appearance of the adult the larva which has lain in the larval state in its cocoon until this time changes to an active pupa, which bursts its cocoon and comes forth without shedding its skin and exists then as an active pupa at the surface of the ground from twenty-four to forty-eight hours. It then sheds its skin and becomes the true imago. These breedings have proven the, hitherto considered, distinct species of *Macroxyela ferruginea* and *Macroxyela infuscata* to be identical. The former has consisted of the females, while the latter has consisted of the males. Larvæ enter the ground about June 1st.

Pteronus fulvricus.—Young larva jet black and possessing a lateral row of yellow spots; anal area black.

Intermediate stage has head black and body green with yellow spots and a dorsal band of black; venter light with black tubercles; prolegs

greenish except for black tubercles. The black line on the dorsum grows more and more broken with each moult until it disappears, except for the black of the tubercles.

Full-grown larvæ are about 1.75 cm. in length and caterpillar-like, green with black tubercles and a lateral row of yellow spots, prolegs on abdominal segments 2–7 and 10, anal area like body, black, antennæ wart-like. Feeds on Salix sericea.

Head black or dark brown, with the following parts lighter: a small spot on the genæ between the ocelli and the post-clypeus, the antennæ, the labrum, the labium, and the mandibles and maxillæ except for rufous tips. Body green, with the following parts black: a "Y"-shaped sclerite on the venter of the prothorax, two dorsal tubercles and two tubercles just above the base of the leg on the prothorax, five dorsal tubercles and two just above the base of the leg on both the meso- and metathorax, also a slight cloud of black on the caudal annulation of both segments and one on the cephalic annulation of the metathorax, on normal abdominal segments five dorsal tubercles, two just above the base of the proleg and one on the proleg itself, a black dot between each pair of prolegs except the anal pair, a spot at the centre of the anal area, and the tips of the cerci. A yellow spot of more or less quadrate outline on every segment of the body except the last two abdominal segments just caudad of the spiracle. Legs greenish-white except for a black tubercle on the basal joint and rufous claws. Cocoon is about .9 cm. in length, double elliptical and spun of dark brown silk.

Larvæ are gregarious edge-eaters, two brooded, the adults appearing in May and July. Spins cocoon below the surface of the ground.

Phymetocera fumipennis.—Larvæ about 1.25 cm. in length and caterpillar-like, body white above and yellow beneath, tubercles black, head black, prolegs on abdominal segments 2–8 and 10, anal area like the body, antennæ five-jointed. Feeds on Smilacina racemosa.

Head dark brown, with the following parts light: the post-clypeus except a spot at the base and one in each depression, the ante-clypeus except a dot in each lateral angle, the labrum at the base, the maxillæ except the tips, a spot on the front at the base of the post-clypeus, and the genæ below a line passing just dorsad of the antennæ. Palpi black except at the joints. Ocelli black.

Body.—Prothorax yellowish, with five black tubercles in a line above the base of the leg. Tubercles simple. Meso- and metathorax white

above and yellow below, with eight black tubercles in a double line above the base of the leg. Metathorax with a black spot on the stigmatal line. Abdomen yellowish below and white above, with eight black tubercles in a double line above the base of the leg on each normal segment. A black spot on the stigmatal line of each segment except the tenth, and a dark clouded area connecting the dots of adjoining segments. Clouded area absent between the dots of the eighth and ninth segments.

Legs gray, with the following parts white : an oblique suture on the first segment, the whole second joint and the third and fourth below.

Remarks.—The larvæ feed on the flowers of the plant, stripping the racemes of the blossoms. In habits they are gregarious, and when the blossoms are consumed the larvæ migrate to the leaves and there complete their development. When feeding on the leaves the larvæ change from the light colour of the time of flower feeding to a dark greenish-slate. This is caused by the food showing through their thin skins. Cocoons are of dark silk, single, and spun beneath the surface of the soil, larvæ entering the ground last of June.

THREE NEW COCCIDÆ FROM BRAZIL.

BY T. D. A. COCKERELL, N. M. AGR. EXP. STA.

Icerya (Crypticerya) Hempeli, n. sp.— ♀. Exposed on bark, subglobose, much like a very large *I. rosæ.* Length 8, breadth 7½, height 5⅓ mm.; dark slate-gray, with a thin but rather dense coating of cream-coloured mealy secretion. Subdorsal areas marked by a longitudinal series of small round spots free from secretion. Legs piceous or dark brown.

Boiled in liquor potassæ, stains the liquid bright pink. Antennæ and legs after boiling pale reddish-brown. Antennæ small and short, 9-segmented, formula approximately (219)(345678), the segments bracketed being subequal in length : 1 nearly twice as broad as long ; 9 short and broad, inversely heart-shaped. Legs small but stout, femur fully twice as thick as tibia ; tarsus not quite half length of tibia ; claw large, moderately curved. Skin chitinous, very strongly so at the sides, remaining deep sienna-brown after prolonged boiling. There are numerous small glands, which in the less chitinized parts are situated on chitinous patches, the skin between these patches being free from coloured chitin. Towards the sides these patches coalesce, and the whole surface becomes reddish-brown, with the gland-orifices showing as clear dots. There are also

some larger gland-orifices scattered here and there in this area. The skin, in the places where it is colourless, is minutely granular. In the sublateral ventral regions is a considerable quantity of short, light, reddish-brown hair. I find no compound glands, such as exist in *I. Ewarti*.

Hab.—Campinas, Brazil, May 12, 1898, on *Mimosa* (?). (*A. Hempel*, 215 d.)

Mytilaspis bambusicola, n. sp.— ♀. Scale a little over 2 mm. long, very narrow, of uniform width, rather convex, white; with dark sepia-brown exuviæ, which are sculptured in a cancellate manner. After boiling in liquor potassæ, the scale dissolves to a milky substance, which consists of fragments of minute moniliform threads.

♀. Greatly elongated; four rounded produced very distinct lobes, all wide apart, the median ones the larger; in the interval between the lobes a short bifid process; immediately laterad of each median lobe a very long gland-hair or squame, nearly twice as long as the lobe; a similar squame a short distance beyond each second lobe, and three more at long intervals on the margin beyond. Beyond the second, third and fourth squame or gland-hair the margin in each case presents two obtuse elevations, not always very distinct. No groups of ventral glands, but many pairs of transversely elongate gland-orifices scattered over the pygidial area. Embryos in ♀ very large.

Hab.—Campinas, Brazil, May 12, 1898. On stem of bamboo, with *Asterolecanium bambusæ*, Boisd. (*A. Hempel*, 215 c.). *M. bambusicola*, by the absence of circumgenital glands, etc., approaches *M. striata*, Maskell. The brief preliminary description published by Green of his *M. elongata* is rather suggestive of our species. Fortunately, I have some *M. elongata* from Mr. Green, found on leaves of *Arundinara*, at Pundulova, Ceylon. The insect is now doubtfully referred by Green to *Chionaspis*, and it may well go there, having a *Diaspis*-like ♂ scale, with a vaguely indicated keel. The ♀ scale will easily be known from *bambusicola* by its light orange-brown exuviæ.

The following species of *Mytilaspis* will be published in the *Revista do Museu Paulista* (Brazil), but it is desirable to present an abstract of the characters in an entomological journal:

Mytilaspis argentata, n. sp.—♀ scale about 2½ mm. long, often curved, very narrow—linear, in fact—but covered and broadly margined

with a film of semitransparent silvery secretion, which under the microscope has a reticulated structure, resembling a skeletonized leaf. Scale dark brown, exuviæ dull orange. ♂ scale white, the filmy margin broad, so that the scale becomes oval, or sometimes subcircular. The ♂ and ♀ scales congregate in large patches on the leaves, and even the area between them is thinly covered with the silvery secretion.

♀. Very long and narrow, dark red. No groups of circumgenital glands. Four lobes, and many pointed processes of the margin. Embryonic larva with two large figure-of-8 glands in the cephalic region.

Hab.—On leaves of a forest tree, Campinas, Brazil; April, 1898. *(F. Noack.)*

I will take this opportunity to record a new locality and food plant for *Aspidiotus dictyospermi*, Morgan. Dr. F. Noack found it in May, at Campinas, Brazil, on leaves of ivy *(Hedera helix)*.

CONTRIBUTIONS TO COCCIDOLOGY. — I.

BY J. D. TINSLEY, NEW MEXICO AGR. EXPT. STA.

DACTYLOPIUS SORGHIELLUS, Forbes. Syn. *D. Kingii*, Ckll.

Dr. S. A. Forbes has kindly sent me the type material of this species, which I have examined with much interest. The material studied consisted of 4 specimens. As is usual with these subterranean forms the antennæ are quite variable, both in the number of segments and their relative length.

Only two of the antennæ of the 4 specimens were 8-jointed, the others being 7-jointed, and some plainly aborted. After careful measurement and study, I conclude that the forms described by Cockerell in *Science-Gossip*, Feb., 1897, p. 240, as *D. Kingii*, must be referred to this species.

I have studied quite a number of specimens of subterranean ant's-nest forms collected by Mr. Geo. B. King around Lawrence, Mass., and have called those specimens *D. Kingii* which had an antennal formula of 81237564. Joint 1 is usually appreciably longer than either 2 or 3, although 1, 2 and 3 may be subequal; 7 is sometimes longer than 3, and 6 sometimes longer than 5.

By examining a considerable number of specimens, however, the formula stated above will always be found to stand out quite prominently.

By way of parenthesis let me add here, that no one should undertake to describe the antennal characters of a species of the *Dactylopinæ* from

one or two individuals. The antennæ of all species which I have studied vary greatly both as to the absolute and relative length of the segments. One should measure quite a number, and then select that formula as typical which occurs oftenest. I have on several occasions come very near making serious mistakes by neglecting this : and as a further illustration I might add that Prof. Cockerell's types of both *Ripersia Blanchardii* and *R. flaveola* are specimens with malformed antennæ.

Among the specimens of "*D. Kingii*" from Mass. two forms may be roughly distinguished : one having joint 1 of the antennæ, about 40–50 μ long ; and joint 8, 75–80 μ long ; the femur, 140–170 μ long and about 80 μ broad. The second form has jt. 1, 50–65 μ long ; jt. 8, 90–110 μ long, and the femur 200 μ or more long, and about 80 μ wide.

One would be inclined from their general appearance under the microscope to divide them at least into a species and variety ; but some specimens show intermediate characters. The specimens of *D. sorghiellus* from Mr. Forbes belong to the group of the smaller individuals, while Cockerell's type of *D. Kingii* inclines toward the larger. It may be possible at some future time to separate the latter at least as a variety, but I do not feel justified in doing so at present.

Eriococcus Gillettei, n. sp.—Adult ♀. Ovisac pure white, elongate ellipsoidal, 2–3 mm. long. The ovisacs may be crowded together, but each retains its form ; *i. e.*, they do not become a confused mass of cotton.

Dead, shriveled, females brownish and scarcely 1 mm. long, mounted they are about 2 mm. long. When cleaned and mounted the dermis is colourless and bears numerous glands and conical spines ; the spines, however, are not so large or numerous as in *E. adenostomæ*, Ehrh., the largest being 15μ long ; the glands also seem to predominate over the conical spines, while in *E. adenostomæ* the spines are most numerous ; there are also a few large hairs scattered over the dermis. Antennæ 7-jointed, the joints quite variable in both actual and relative lengths, each bearing the usual hairs ; joint 1 can seldom be measured ; joint 2, 28–31 μ long ; joint 3, 45–60 μ long ; joint 4, 25–40 μ long ; joint 5, 15–25 μ long ; joint 6, 20–25 μ long ; joint 7, 25–45 μ long. It is almost impossible to give an average formula, but joint 3 is always longest. Legs rather long and slender ; femur about 150 μ long by 50 μ wide ; tibia 100–110 μ long by 30 μ wide ; tarsus 115–135 μ long by 20 μ wide. Digitules of tarsus quite long and knobbed ; digitules of claw also quite long and knobbed. Segments of leg with the usual hairs. Anal ring with eight

rather large hairs, 105 μ long. Caudal tubercles well developed, bearing one or two large hairs, several conical spines and a large seta, 140 μ long.

Hab.—On *Juniperus virginiana*, L., at Solida, Colo.; October, 1898. Collected by Prof. C. P. Gillette.

This species, *E. araucariæ*, Mask., and *E. adenostomæ*, Ehrh., resemble each other so closely externally that they cannot be distinguished by their external appearance. *Araucariæ* and *adenostomæ* resemble each other in the spines, but *araucariæ* has the spines rather more conspicuous, especially a row around the margin, which do not clear as easily as the rest, and therefore stand out rather prominently. In *araucariæ* the tibia and tarsus are subequal, while in *Gillettei* the tarsus is distinctly longer than the tibia, in *adenostomæ* they are nearly subequal. The length of the third joint of the antennæ in *Gillettei* is between those of the other two. *Araucariæ* has the caudal lobes distinctly prolonged, while that is not true in either *Gillettei* or *adenostomæ*.

This species seems to be of economic importance, as Prof. Gillette writes: "The little trees from which I took these specimens seemed almost to be dying from the attacks of these insects. At first I thought the trees literally covered with some *chionaspis* on bark and leaf."

EARLY STAGES OF TRIGONOPHORA PERICULOSA. Gn.

BY REV. THOMAS W. FYLES, SOUTH QUEBEC.

Eggs.—Laid dispersedly on the 11th of August. They were pinkish-white in colour; somewhat flattened; striated, and had cross indentations. They hatched on the 21st of the month.

Newly-hatched larva.—A half-looper; one-tenth of an inch long. Head bilobed, large. General colour a very pale olive-green, with numerous black warts on head and body, and a few white bristles. Mandibles amber-coloured. Feeds on *Plantago major*. Moulted August 28th.

Larva after first moult.—Length a quarter of an inch. Head small, dark brown. Body colour very pale green. Has four sage-green lines down the back, and is dotted with numerous small brown warts, each bearing a single brown hair. Moulted September 4th.

Larva after second moult.—Length half an inch. Head amber-coloured, spotted with brown. Body sage-green above, greenish-white below. The two shades separated by a double line—the upper part

brown, the lower white. Along the back is a chainlike series of angular brown lines forming diamond-shaped divisions. In the hinder angle of each division is a conspicuous white spot. The larva lies hid during the day, and comes out and feeds at night. When disturbed it curls up into a bunch. Moulted September 21st.

Larva after third moult.—Length after moult six-tenths of an inch. Head amber-coloured, slightly greenish; has a few brown markings and a few white hairs. Body colour of larva above rich warm green, with brown markings and a dorsal line of white spots. Spiracular line creamy-white. Under side of larva pale green with reddish-brown spots. The larvæ are hibernating in this stage. There are probably two broods of *T. periculosa* in the year.

BOOK NOTICE.

THE PTEROPHORIDÆ OF NORTH AMERICA.—By C. H. Fernald, A.M., Ph. D. Revised edition, July 30th, 1898. Boston: Wright & Potter Printing Co., 18 Post Office Square. 1 Vol., 8oo; 84 pp., 9 plates.

Any one who has a copy of Prof. Fernald's Manual of the Crambidæ of North America will hardly need to be told that this later work is exactly what every student or collector of the micro-Lepidoptera wants, and that the way is now made easy for him when he wishes to identify his plume-moths and learn all that is thus far known about the North American species. It is characterized by its author's well-known accuracy and conciseness of statement, and is a complete monograph of the family as far as this continent is concerned. It begins with an historical account of the family in the writings of European entomologists and the more recent publications in America. This is followed by short chapters on the structure, habits, early stages and systematic position of the plume-moths. The body of the work is taken up with descriptions of the genera and species, including very useful synopses in each case. Three of the plates illustrate the external anatomy and the structure of the wings, the remainder depict the genitalia of the species. We miss, however, the exquisite coloured plates that so beautifully illustrated the Crambidæ. We need not say more than that this is a full and entirely satisfactory work on the Pterophoridæ, and that it maintains the high standard of excellence that we now expect in the author's scientific productions.

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A LIST OF MANITOBA MOTHS.—Part II.

BY A. W. HANHAM, WINNIPEG, MAN.

This list was commenced on page 291 of Vol. XXIX. of this magazine. Since then another season has come and gone, and Mr. Heath, of Cartwright, has kindly submitted all his moths to me for names. Some good collecting has also been done by Mr. Marmont, at Rounthwaite. The result is, as will be seen by a perusal of the subjoined list, a very respectable addition to the Sphingidæ and Bombycidæ of this Province.

Collections made by Mr. Criddle, at Douglas, and Mr. Hutchinson, at Kinosota, have not been seen yet; they no doubt will yield some new or rare species, especially as both localities should be good ones. At Douglas there is a very large spruce and tamarac swamp, and Kinosota is close to Lake Manitoba, and has besides extensive forest lands in the district.

For collecting at light, the past season (1898) does not compare with the previous one. There were fewer good evenings, and never were insects (mosquitoes excepted) in the same abundance. An early beginning was made, however (April 14th), and in May, especially, a number of fine species showed themselves. The Cartwright records are Mr. E. F. Heath's captures, and the Rounthwaite ones Mr. L. E. Marmont's. Cartwright is in southern Manitoba, close to the border, and Rounthwaite lies about fifteen miles south-west of Brandon, almost at the foot of the Brandon Hills. Both appear to be "A.1" localities for the lepidopterist.

It is owing to the continued kindness and assistance of Dr. H. G. Dyar that I am able to make this list complete up to date. All my new insects, as well as those from Rounthwaite and Cartwright, have been referred to him.

Hemaris rubens, *Hy. Edw.*—Plentiful around "thorn" bloom in open woods on May 24th, and easily netted; a few H. ruficaudis, *Kirby*, were out with them, but they were very wild and every one was missed. Also from Rounthwaite and Brandon.

Lepisesia flavofasciata, *Barnst.*—One at Rounthwaite in May. The moth was not sent away, but Dr. Dyar kindly sent a description, by which it was identified.

Ampelophaga chœrilus, *Cram.*—Cartwright.

Triptogon modesta, var. occidentalis, *Hy. Edw.* — Cartwright, Douglas, and Rounthwaite.

Smerinthus cerisyi, *Kirby.*—At light, May 17th, 20th, and 23rd (four specimens altogether). Also from Cartwright and Rounthwaite. Geminatus was common on above dates, and came to light again on July 13th and 22nd, when, however, it was not accompanied by cerisyi.

(Paonias myops, *S. & A.*—My record of this species for Manitoba was confirmed on June 15th, when a beauty came to light and was captured. No others showed up.)

Bembecia marginata, *Harr.*—Cartwright.

Sesia tipuliformis, *Linn.*—July 31st, one at rest on a currant bush on the prairie.

Thyris maculata, *Harr.*—June 19th, two at rest on yellow flowers on the prairie.

Nola fuscula, *Grt.*—July 12th, at light, rare. This species was also taken at light in 1897.

Hypoprepia fucosa, var. plumbea, *Hy. Edw.*—July 12th to 22nd, rare at light. Dr. Dyar informs me that H. miniata, *Kirby*, is a good species (not a var. of fucosa). I have not taken miniata in Winnipeg, but Mr. Heath tells me it has always been very plentiful with him at light. My record of this species from Brandon was correct.

Lithosia bicolor, *Grt.*—Aug. 8th, one at light. Also from Cartwright.

Crocota laeta, *Bdv.*—July 12th, a pair at light.

Arctia Williamsii, *Dodge.*—From Cartwright and Rounthwaite. According to Dr. Dyar, a good thing, and quite unexpected from Manitoba.

Phragmatobia rubricosa, *Harr.*—From Cartwright.

Leucarctia acræa, *Dru.*—From Cartwright and Rounthwaite.

Euchætes oregonensis, *Stretch.*—Single examples at light on June 17th and 23rd. Also from Cartwright.

Halisidota tessellata, *S. & A.*—July 28th, one at light.

Ichthyura strigosa, *Grt.*—Two at light about the middle of July; also from Rounthwaite. This species may have been more abundant than the record shows, as it was confused with *vau*, which was very common at light.

Gluphisia severa, *Hy. Edw.*—April 25th, one at Rounthwaite. This moth was named by Dr. Dyar from a description which I sent to him.

Notodonta stragula, *Grt.*—May 25th and June 17th, single examples at light.

Notodonta simplaria, *Graef.*—June 17th and July 13th, single examples at light.

Lophodonta georgica, *H.-S.*—A beauty at light on June 19th.

Nerice bidentata, *Walk.*—May 24th and 25th and July 13th, at light.

Schizura leptinoides, *Grt.*—From Cartwright.

Coelodasys apicalis, *G. & R.*—From Cartwright (unique).

Cerura multiscripta, *Riley.*—From Cartwright (unique).

Cerura aquilonaris, *Lint.*—May 17th and 20th, at light.

Prionia bilineata, *Pack.*—From Cartwright.

Hemileuca maia, *Dru.* (?)—A species of Hemileuca occurs in Manitoba, but which one has not yet been determined with certainty. On September 6th, 1897, Mr. Boger noticed a number of large moths on the wing in the daytime in the vicinity of the Douglas swamp. Among a lot of paintings of lepidoptera, done by Mr. Criddle, of Douglas, I noticed a Hemileuca which seemed pretty close to Californica, and from the same paintings Mr. Boger was able to place his day-fliers. Early in July, 1898, Dr. Fletcher found larvæ of a Hemileuca feeding on aspen at Bird's Hill, near Winnipeg; these have since produced H. maia, var. lucina, *H. Edw.*

Clisiocampa disstria, var. thoracicoides, *N. & D.*—This form occurred here in July with disstria. Both were rare.

Cossus centerensis, *Lint.*—June 12th, one at light, also seen from Cartwright. My capture was in beautiful condition. I found it resting on the window-sill close to my lamp, and it showed no desire to move even when bottled.

Cossus populi, *Walk.* (?)—Dr. Dyar in naming this did so with a query. From Cartwright.

Prionoxystus robiniæ, *Pack.*—From Cartwright. Mr. Heath says he got several of these moths from some oak logs used in the construction of his house.

Hepialus mustelinus, *Pack.*—July 18th and 21st. Both specimens taken were fresh. The first was discovered at rest on the wall of my house towards dark, the other was sitting inside one of my open cellar windows. None came to light.

NOTES FOR 1898.

Deilephila gallii was common both at bloom and at light; lineata did not show up at all.

Sphinx albescens appears to have been plentiful at Rounthwaite, and a pair of luscitiosa were captured there.

Ceratomia undulosa seemed to be not uncommon in Elm Park, at rest on trees, and Cressonia juglandis came frequently to light.

Argryrophyes cilicoides turned up again about the same date, and several were taken.

Platarctia hyperborea has been taken at Cartwright and Douglas.

Arctia virgo and Saundersii were both equally common again at light, and I took several virguncula in the same way.

Halisidota maculata came to light several times, and some more were secured from pupæ found under boards in Elm Park.

Tortricidia testacea was one of the most abundant species coming to light, and came in from June 18th to July 13th.

The Ichthyuras appeared at light as early as May 13th, and they are apparently double-brooded here. The May lot of albosigma were much lighter coloured and handsomer than those taken in July, and among the latter not a single pale one was seen either season.

Schizura ipomeæ was not common as in 1897, and not a single cinereofrons was taken.

Both Dryopteris rosea and irrorata were more plentiful than the previous season, and were out for several weeks.

This year I took Anisota virginiensis at light, and Clisiocampa fragilis was quite common.

Phyllodesma americana came to light on May 17th and 20th, and was not seen later. (TO BE CONTINUED.)

ACKNOWLEDGMENT.

I desire on behalf of the Entomological Society of Ontario to acknowledge the receipt of some very fine Manitoba Noctuids, from Mr. L. E. Marmont, of Rounthwaite, Man., which are new to the Society's collection. Some of them have only recently received their names, and many of them are particularly attractive species; as *Oncocnemis atrifasciata*, Morr., for instance, which makes this generous donation of Western material a useful and much needed addition to the Society's collection, and therefore more than usually valuable and acceptable. The gratitude of the Society to the considerate donor is specially due.

J. ALSTON MOFFAT, Curator, London, Ont.

NOTES ON ARKANSAS TRUXALINÆ.

BY JEROME MCNEILL, FAYETTEVILLE, ARK.

This subfamily is rather poorly represented in Arkansas, only eight of the thirty-one genera recognized by me as occurring in North America having been found within its borders, and only one genus, *Orphula*, is represented by more than a single species.

Mermiria rostrata, McNeill.—Has not been found in the State, but its occurrence at Mackay, I. T., makes it altogether probable that it belongs to our fauna.

Truxalis brevicornis, Linn.—Occurs in the central part of the State, but has not yet been found in the mountainous Northwest.

Erritettix virgatus, Scudd.—This species must be said to be rare. I have found it nowhere in the State except in a few localities about Fayetteville. It is probably the first Orthopteron which reaches maturity in the spring. As early as April fourth there were no pupæ to be found.

Syrbula admirabilis, Uhler.—This is a southern form, and by far the most common of the Truxalinæ. It is abundant in old pastures. It reaches maturity about the first of July. Brown females are much less common than brown males, but they are not rare.

Chloealtis conspersa, Harr.—An uncommon species, so far as my observation goes. It is represented in my collections from Arkansas by a single pair (male and female) of adult specimens and by three pupæ. These specimens were all taken early in July, and they were always found about the head of wooded ravines in north-west Arkansas. When compared with Illinois specimens these are seen to be larger, the male measuring 25 mm. The female is noticeably different from northern specimens in having the tegmina subacute and the sides of the head, pronotum and abdomen black or very dark fuscous. In the young the antennæ are more distinctly flattened basally than in the adult.

Dichromorpha viridis, Scudd.—This species is widespread, though nowhere abundant, and scarcely common. The brown is about as common as the green variety amongst the females.

Orphula pelidnus, Burm.—This species is the commonest *Orphula* in the State, though it is not abundant or scarcely common in the northwest. In the central and southern parts of the State it is abundant.

Orphula speciosa, Scudd.—This species is much more uncommon than I had formerly supposed. I have found it in a few widely scattered localities only.

Orphula decora, McNeill.—No other specimens have been found since the single one, on which the species is based.

Boopedon auriventris, n. sp.

Vertex prominent, declivent, convex, not separated from the front by distinct carinæ, not forming an angle with the front, but united with it in a curve, as wide between the eyes as the long (female) or short (male) axis of the eye ; foveolæ of the vertex entirely wanting (female) or barely discernible (male); foveolæ of the tempora obsolete or represented by punctate areas, plainly visible from above ; front moderately inclined, the costa broad, with the sides generally parallel, half as wide as the space between the eyes, convex, suddenly constricted just above the antennæ, vanishing much before the clypeus ; antennæ filiform, yellowish at the base, beyond usually much infuscated, longer (female)or much longer (male) than the head and pronotum. Disk of the pronotum subtectiform ; posterior margin straight, sides constricted, especially at the first sulcus ; median carina strong, percurrent, cut much behind the middle by the principal sulcus ; lateral carinæ obsolescent, more distinct in the male, especially on the anterior part of the progone; lateral lobes arcuate dorsoventrally narrow, a little wider (deeper) than long, with the posterior margin perceptibly more oblique than the anterior, the lower margin very obtusely angulate. Space between the mesosternal lobes strongly transverse, that between the metasternal lobes linear, with a deep sulcus on either side (male) or slightly transverse (female), with equally deep sulci. Tegmina not exceeding half the length of the abdomen, ovate, rounded at the tip (male) or subacuminate (female). Posterior femora long, moderately slender, banded above and on both outer and inner surfaces (male) or bands more or less completely obsolete (female). Posterior tibiæ red at least on the distal half, basally frequently lighter, with more or less distinct infuscations near the middle and at the extreme base ; apical spines on the inner side very unequal, the longer about equalling in length the terminal joint of the tarsus with its claws. Ovipositor nearly included. Colour very variable, either nearly uniform fuscous-brown or testaceous, with a more or less distinct olive tinge, enlivened with variable fuscous markings ; in the lighter specimens there is a fuscous stripe just below and parallel to the tempora, preceded by a light yellow stripe ; the sides of the head have a broad fuscous stripe reaching from the upper posterior margin of the eye to the pronotum, broadening rapidly ; the lateral lobes of the pronotum are typically infuscated except

for a narrow anterior and a broad posterior band; the abdomen has a series of large quadrate fuscous spots along the sides (female) more or less replaced by bright red (male); the dorsal surface of the abdomen and less frequently the disk of the pronotum and the top of the head are bright yellow or brownish-testaceous; ventral surface of the abdomen more or less distinctly yellow, with the last two segments in the male red. Length: male, 22 mm; female, 38 mm.; tegmina: male, 7 mm; female, 9½ mm.; hind femora: male, 15½ mm.; female, 23½ mm. Fourteen adult males, twenty adult females, seven pupæ, from the summit of Sulphur Springs Mountain, on the line between Boone and Newton counties.

This species is so different in the position of the principal sulcus of the pronotum and in the character of its posterior margins from the other species of *Boopedon* as to perhaps deserve to constitute a genus by itself. Its occurrence is quite remarkable. Sulphur Springs Mountain stands probably as much as a thousand feet above the valley, and with the exception of two or three neighbouring mountains, it decidedly overtops all the surrounding country. This mountain is a high ridge, probably one and a half miles long at the summit. At either end there are considerable prominences, composed of massive millstone grit. One of these is surrounded by clifts on all sides, so that the top can be reached with some difficulty; the other has the clifts broken down in places, so that its summit is much more readily accessible. On both of these a tall coarse grass grows luxuriantly, and among this grass this species was found in abundance over the few square yards of the least accessible peaks. A single male was found on the other peak. As several days were spent in collecting in this vicinity, and as particular pains were taken to secure all the specimens possible, and since no other specimens have been found elsewhere, though seven weeks were spent in the summer of 1897 by the writer and a party of three others in collecting in Northwestern Arkansas, it is reasonable to conclude that this species is an old resident which has inhabited the country since the times when the Ozark plateau was a level plain. As erosion carved out the valleys, the level surface was more and more restricted in areas until at the present time it is represented by the summits of the highest mountains. In this way *auriventris*, which is a grass-loving prairie species, has been hemmed in by the encroaching forests until it now maintains a precarious foothold on a few isolated mountain summits. Under such circumstances wings would be a disadvantage, so they have been shortened by natural selection.

NOTES ON THE AMERICAN FORMS OF EUCHLOE, Hubner.

BY WILLIAM BEUTENMULLER, CURATOR, DEPARTMENT ENTOMOLOGY, AM. MUS. NAT. HIST., NEW YORK.

In answer to Dr. Butler's comments (Can. Ent., XXXI., p. 19) upon my revision of the species of *Euchloë* (Bull. Am. Mus. Nat. Hist., X., pp. 235–248), I could state that Dr. Butler may possibly be right in considering *creusa* (var. *elsa*), *hyantis* and *lotta* seasonal forms of *ausonides*, but with the present knowledge it is not possible to place them so, and for this reason I concluded it would be best to allow the species to remain distinct until more light could be obtained on the subject. At any rate, I was certain that what we had labeled in our collections as *creusa* was not Doubleday and Hewitson's species, which Dr. Butler definitely asserts is my var. *elsa*. What seems to me strange is, how was it that Edwards did not recognize the figure of *creusa*, sent to him by Dr. Butler. *Creusa* (var. *elsa*) cannot be mistaken for either *hyantis* or *lotta* (so-called *creusa*). Doubleday and Hewitson did not give a description of *creusa*, and their figure of the species is unrecognizable, consequently has no scientific value. *E. olympia*, I can assure Dr. Butler, is not a *Zegris*, but belongs with *ausonides*. In the genus *Zegris* the head is very thickly scaled and the palpi are very short, while in *E. olympia* the palpi are long, and in all other respects it agrees with *ausonides* generically. *Cethura* and *pima* do not strictly belong to *Midea* as placed by me. Mr. Grote erected the generic name *Tetracharis* for *cethura* (Proc. Am. Phil. Soc., XXXVII, Jan., 1898, p. 37). In this paper, of which I had no knowledge when writing my own, Mr. Grote referred the American species, with orange blotch in the male, to *Euchloe*, with *cardamines* of Europe as the type, as proposed by Kirby, Scudder, myself and others. He further states that the white species of both continents are slightly more specialized and might be kept under the title of *Anthocharis*, consequently my conclusions, which were worked out independently, are the same as those of my friend Grote. Dr. Butler's remarks about the venation are practically the same as mine, only that he counts the veins differently. Mr. Grote has given excellent figures of the venation of *ausonides*, *cardamines* and *cethura*, to which the reader is referred. Dr. Skinner, in his recent catalogue of North American Rhophalocera, 1898, places *thoosa* as a synonym of *Reakirtii*. I can definitely assert that it is the female of *julia*. He also places *stella* as a synonym of *Reakirtii*, but it is the yellow variety of the latter.

THE COLEOPTERA OF CANADA.

BY H. F. WICKHAM, IOWA CITY, IOWA.

XXXI. The Pythidæ of Ontario and Quebec.

While the Canadian species of this family are not numerous, they are of considerable interest, and, because of the scattered nature of the literature, often quite difficult to identify. The present paper, while containing little that is new, will serve to bring together in concise form the information necessary to enable the beginner to examine his material intelligently.

In the Leconte and Horn "Classification," the following characters are used as defining the family: "Mouth-parts normal, palpi flexible, front and middle tarsi with five, posterior with four joints. Anterior coxal cavities open behind, head not strongly constricted at base, middle coxæ not very prominent. Thorax not margined and without discal basal impressions, antennæ not received in grooves." In appearance, the members differ considerably among themselves, some (for example *Pytho*) being very much flattened, while others (*Lecontia*, *Boros*, *Priognathus*) are much more convex and of elongate form, recalling that of some Trogositidæ. Two genera, *Rhinosimus* and *Salpingus*, contain small species which are sufficiently like some flattened Rhynchitidæ (e. g., *Eugnamptus*) to have led to their being placed in that family by early describers. The table will serve to distinguish them generically:

A. Large or moderate sized. Head not produced into a beak, mandibles visible beyond the labrum.

b. Third joint of antennæ not longer than the fourth.

Head behind the eyes gradually slightly narrower. *Lecontia*.

Head behind the eyes with a distinct though not strong constriction or neck *Boros*.

bb. Third joint of antennæ distinctly longer than the fourth.

Body very much flattened, depressed, elytra distinctly striate *Pytho*.

Body subcylindrical, elytra punctured, with only faint indication of striate arrangement *Priognathus*.

AA. Small. Head produced into a beak, mandibles exposed beyond labrum.

Beak broad and short *Salpingus*.

Beak prolonged *Rhinosimus*.

The name *Crymodes* has been altered to *Lecontia* in the above

scheme to harmonize with the usage of the latest supplement of the Check-list.

LECONTIA, Champ.

L. discicollis, Lec. (fig. 17), is blackish-piceous ; head coarsely closely punctured, usually with a few irregular smooth spaces on the vertical and occipital regions, sides behind the eyes nearly straight, slightly convergent posteriorly. Antennæ short, not reaching middle of thorax, last three joints broader. Prothorax transverse, about one and a half times as broad as long in the best developed specimens, wider than the head, sides nearly or quite straight and parallel from near apex to behind the middle, thence rapidly narrowing to base ; surface coarsely, closely but unevenly punctured with irregular smooth spaces on median area and a large illy-defined central discal impression, on each side of which is a rather less evident one. Elytra conjointly a little more than twice as long as their width at base, sides nearly parallel to near the tip. Surface rather shining, densely punctured, with several very slightly elevated costæ. Legs short, concolorous with the body. Length of my specimens varies from 10 to 20 mm. = .40–.80 inch. The small individuals resemble the next species very closely in general outline and appearance, but may be readily separated by the shape of the head behind the eyes. The larger individuals have the above-mentioned specific characters much better developed than have the smaller ones. Beaten from pine trees or found under bark.



FIG. 17.

BOROS, Hbst.

B. unicolor, Say, resembles *L. discicollis* in general form and colour, but is usually much smaller and more shining. The head is much narrower than the prothorax, distinctly constricted behind the eyes. Antennæ short, not reaching back to middle of prothorax, last three joints broader, proportionately more so than in the preceding species. Prothorax, by measurement, just perceptibly broader than long, densely, coarsely and rather regularly punctured ; sides regularly rounded, no discal impressions. Elytra elongate, more than two and a half times as long as the breadth at base, sides nearly parallel to near the tip, only slightly broader behind the middle, surface more finely punctured than the thorax, punctuation close, without serial arrangement. Evidences of costæ are very faint. Length, 11–12 mm. = .44–.48 inch. Found under bark.

PYTHO, Latr.

The species of this genus are commonly found under pine bark or

in lumber piles about sawmills. They recall, in appearance, the Carabidæ, without very closely resembling any of that family with which I am acquainted, though suggesting *Cymindis* or *Helluomorpha*. The table following is that of Dr. Horn. I have used the name *americanus*, though in the Henshaw Supplement it is changed to *planus*, Oliv., while Dr. John Hamilton, in Trans. Am. Ento. Soc., XXI., p. 401, replaces it by *depressus*, Linn. Rather than get our students tangled up with so much shifting, I have adhered to Kirby's designation, *americanus*, by which it has hitherto gone, and which will enable it to be readily placed when the synonymy is finally set at rest.

A. Base of thorax constricted, forming a collar. Median line of prothorax broad and deep. Brownish, with paler elytra, no metallic lustre. .65 in. *strictus*, Lec.

AA. Base of thorax not constricted, sides arcuate from front to hind angles. Median line fine.

b. Colour, when mature, black, shining. Legs black or brown. No metallic lustre.

Prosternum in front and gula not punctate. .44–.46 in. *niger*, Kirby.

bb. Colour piceous or castaneous, varying occasionally to rufous, with violet or bluish surface lustre. Legs, antennæ and under side reddish-yellow. Prosternum more or less punctured, gula transversely wrinkled. .45–.60 in. (fig. 18). *americanus*, Kirby.

PRIOGNATHUS, Lec.

While agreeing with *Pytho* in having the third antennal joint much longer than the fourth, *P. monilicornis*, Rand., is in form much more like *Lecontia*, but is more convex. A specimen in my collection answers to the following description: Piceous, shining, head narrower than the prothorax, distinctly punctured, the punctures larger and better separated on the median area. Between the antennæ is a deep transverse impression. Eyes small, rounded, prominent, sides of head behind them slightly and regularly convergent. Antennal club gradually formed. Prothorax widest about the middle, broader than the head, sides rounded, strongly and regularly sinuate near the base; punctuation rather coarse, the punctures well separated, not crowded, disk with a large, vague impression



FIG. 18.

on each side near the middle. Elytra elongate, sides subparallel to near the tip, at base broader than the greatest thoracic width, surface coarsely, closely punctured without definite serial arrangement, costæ fine, indefinite, outer elytral margin reflexed, slightly explanate. Legs short, abdomen rather finely and very clearly punctured. Length, .34 in. Found under logs in coniferous forests.

SALPINGUS, Gyll.

S. virescens, Lec., resembles somewhat in form an extremely small *Pytho*. It is greenish-black, shining, head with distinct punctures, rather sparsely placed, eyes prominent, antennæ reddish, the last three joints (which form the club) piceous. Prothorax a little broader than the head, widest about one-fourth from apex, thence arcuately narrowing anteriorly, posteriorly somewhat obliquely narrowed to near the hind angles, which are rectangular and distinct. Surface shining, punctures of moderate size but sparsely placed, an illy-defined impression on each side at the broadest part. Elytra at base broader than their junction with the thorax, widening behind the middle, striate, the striæ fine and shallow, with rows of distinct, closely-placed punctures at bottom, interspaces flat. Humeri prominent. Under surface and legs blackish. Length, .10 inch.

RHINOSIMUS, Latr.

The original description of our Canadian species of this genus was drawn up by Mr. Randall, who described *viridiæneus* as a species of *Rhynchites*. It does bear some slight resemblance in form to certain flattened Rhynchitidæ, for example the genus *Eugnamptus*, but the correspondence is by no means close. I have none at hand for description, so append Dr. Leconte's diagnosis of *R. nitens*, which is now considered identical with *R. viridiæneus*, Rand. Elongate, blackish-green, highly polished, head and rostrum strongly punctured. Beak flat, twice as long as wide, narrowed at middle, wider at tip. Tip and mouth testaceous. Thorax scarcely broader than long, narrowed behind, sides rounded anteriorly, disk coarsely punctured, quadrifoveolate. Elytra about twice as wide as the prothorax, seriately punctured, alternate interspaces sparsely uniseriately punctate; near the base is a deep arcuate transverse impression. Beneath piceous or piceo-testaceous. Head with large punctures beneath. Length, .15 inch.

I have purposely made the descriptions of the species of this family more detailed than most of those treated in foregoing papers, because

of the less-known character of the insects themselves. No complete monograph of the American species has appeared, but some genera have received treatment as cited below :

1868. Geo. H. Horn. New species of Coleoptera from the Pacific District of the U. S. Trans. Am. Ent. Soc., II., p. 136 (Table of *Cononotus*.).

1879. J. L. Leconte. New Coleoptera. North Am. Ento., Vol. I, p. 4 (Table of *Rhinosimus*.).

1888. Geo. H. Horn. Miscellaneous Coleopterous Studies. Trans. Am. Ent. Soc., XV., p. 45 (Table of *Pytho*.).

ON THE LARVÆ OF NORTH AMERICAN NOLIDÆ, WITH DESCRIPTIONS OF NEW SPECIES.

BY HARRISON G. DYAR, WASHINGTON, D. C.

Genus Roeselia, Hübner.

R. triquetrana, Fitch.

The larva lives on witch hazel. See Psyche, VI., 110 *(trinotata)*.

R. minna, Butler.

The larva is unknown.

R. sorghiella, Riley.

The larva lives in a web on sorghum. See Psyche VI., 110. It is pale yellowish, a red-brown band along warts i + ii, a paler waved band below wart iii and another just above wart vi ; hair short, pale, a few long ones. Feet of joint 7 wanting.

R. melanopa, Zeller.

The larva is unknown.

R. pustulata, Walker.

The larva is unknown.

R. cilicoides, Grote.

The larva is unknown.

Genus Nola, Leach.

N. phylla, Dyar.

Stage III.—Similar to the next ; body all pale yellowish, a tiny dot on joint 7 ; head .4 mm. Previous stages not observed.

Stage IV.—Head pale testaceous, width .8 mm. Body flattened, warts large, in three rows, the fourth concealed, abdominal feet on joints 8 to 10 and 13. Pale greenish, shaded with white and brown, a dorsal brown patch on joint 7 ; subdorsal region irregularly streaked with brown. Hair short and bristly on the upper two warts, very long from

the lower wart, which is lappet shaped. Hair pale, the warts pale brownish; a faint dark dorsal line.

Stage V.—Head brownish testaceous, width 1.2 mm. Body as before, but browner, the mark on joint 7 smaller; a fainter one on joint 11, double. Third wart produced, its hair long and abundant, warts above with the short hair black tipped. Body pale yellowish, a geminate dorsal band of the ground colour, sides below this all faintly brown mottled except at the extremities; warts whitish with a brown ring at the base.

Stage VI.—Head whitish, mottled with brown on the lobes, jaws black; width 1.8 mm. Dorsum broadly pale cream colour, a dark brown subdorsal band, the pair joined by a transverse band on joints 7 and 11, mottled; subventer pale. Wart iii papillose. Body flattened, squarish. Hair pale, the short ones from the upper two warts brownish, those from the third wart very long.

Cocoon triangular, of little pieces of bark, as usual in the genus.

Food plants oaks of various species. The larvæ rest on the backs of the leaves. Rather common at Bellport, Long Island, N. Y.

N. fuscula, Grote.

The larva is unknown.

N. minuscula, Zeller.

The larva is unknown.

N. ovilla, Grote.

The larva lives on oak, hiding on the bark. See Psyche, VI., 110.

N. clethræ, n. sp.

Very close to *ovilla*, but a bluer gray, less ashen. The brown tufts do not rest on the costa, the lines are narrow and dotted, especially the t.-p.; ground colour uniform, bluish-ashen; thorax concolorous, collar posteriorly banded with brown; abdomen and hind wings paler, the latter with a faint discal dot and lighter towards the base, all as in *ovilla*, from which the only distinct difference is the general colour. Expanse 16.5 mm. One male, three females. Bellport, N. Y.

Types in the U. S. National Museum (Type No. 4112) and in the British Museum.

Egg.—Flattened especially in a large area above, outline circular but distinctly elongate in one diameter; sides 25-ribbed, a waved line on the surface of each rib, with fine parallel cross striæ, making elongate rectangular cells; the flattened vertex is finely reticulate. Dull, translucent, waxy white; size .4 and .5 mm., .3 mm. high. Laid on the backs of the older leaves close to a vein.

Stage I.—Small, rather thick and square, not lively, sitting on the back of the leaf near the edge, out straight. Head .2 mm., all translucent whitish, the food green. Hairs single, the primary ones only present ; on the abdomen ii is large and black, alternating, leaning outward on joints 7, 9 and 11, the other hairs pale, iv very long, v shorter and pale. Hair i is shorter than ii, iv and v are approximate, iv scarcely higher than v. On the thorax ia is small, ib large and black ; iia and iib close together, iia very small; v is long and vi very small. The hairs are fine, not glandular. slightly spinulose. The skin has fine spinules. No feet on joint 7.

Stage II.—Head .3 mm. wide. All white ; body thick, the slender abdominal feet absent on joint 7. Warts in four rows as usual, i and v apparently coalesced completely with ii and iv ; hairs short, bristly, brownish, not numerous ; warts whitish.

Stage III.—Head .45 mm. As before, all rather opaque white, no marks. Warts small, the hairs bristly, a few long ones at the ends. Thick, flattened, the feet small.

Stage IV.—Head .8 mm. Still all translucent whitish, but the appearance is greenish-gray from the food in the alimentary canal. Warts large, round, iv + v the largest ; spiracles brown. Hair pale, the short ones brown tipped, smooth, not spinulose. Dorsal vessel greenish. Length at the end of the stage 5 mm.

Stage V.—Head 1.3 mm. wide, retracted at the apex, white, the mouth brown, a dark gray patch at the apex of each lobe. Three upper rows of warts large, the lower small, the body short and thick. Ground colour translucent white, but shaded around the base of each wart and in irregular dorsal and lateral bands with dark gray ; large warts of cervical shield brown behind. Hair short, bristly, with brown tubercles and tips, a few long pale hairs from the extremities and third wart. The body is mostly dark above the spiracles. Later there is a reddish-brown broken subventral shade which also tints the third wart. Marks all diffuse, the appearance gray-brown, lighter subventrally.

Cocoon as usual on a twig, triangular and made of bits of bark.

Food plant *Clethra alnifolia*. Larvæ found in all the swamp lands of Long Island that were searched, Brookhaven, Southhaven, Quogue, etc. The larvæ hide, but may be found on dark, damp mornings. Usually they remain white till the last stage, but a few assumed the brown shading in part in the penultimate stage, some even having brown warts at this time.

N. involuta, Dyar.

The larva lives on willow, hiding by day in curled leaves. See Psyche, VI., 248 (‡*minuscula*), and Coquillet, Journ. N. Y. Ent. Soc., VI., 249 (‡*minuscula*).

N. exposita, Dyar.

The larva lives on willow, feeding exposed. See Psyche, VI., 110 (‡*hyemalis*).

N. anfracta, H. Edwards.

The larva is unknown.

Genus Meganola, Dyar.*

M. conspicua, Dyar.

The larva is unknown.

M. minor, n. sp.

Closely resembling *Nola minuscula*, but larger and differing in generic characters. Gray, the male almost whitish, the female more ashen; a dark shade on basal fourth of costa; t.–a. line fine, dark, obscure, undulate and notched; two short lines on costa in median space, reaching subcostal vein only; a slight black streaking at veins 3 and 4 at base. T.–p. line distinct, slender, black, strongly arcuate outward beyond cell; s.–t. line obscure, pale, waved. Hind wings pale, smoky tinged outwardly. Expanse 21 to 25 mm. Three males, one female. Santa Rita Mts., Arizona (E. A. Schwarz). Types in U. S. National Museum (Type No. 4113), and in the British Museum.

The larva is unknown.

M. dentata, n. sp.

Similar to the preceding, though still smaller. Fore wing elongate, ashen; a slight dark shade on costa at base; t.–a. line narrow, dark, running outward to a sharp angle in the cell, where it touches a round dark spot in a dusky cloud that rests on the costa in the centre of the median space. T.–p. line strongly arcuate outward beyond the cell, finely dentate, the tips of the dentations forming points that are stronger than the otherwise faint line. Terminal space indefinitely clouded, the subterminal line hardly resolved. Hind wing pale, cinereous tinted. Expanse 19 mm.

One male, Chiricahua Mts., Arizona, July 4th. (H. G. Hubbard.) U. S. National Museum; type No. 4114.

The larva is unknown.

The larvæ of our Nolidæ are known in 40%. Of the Eastern species, 55% are known.

*In my description (Journ. N. Y. Ent. Soc., VI., 43), I stated that vein 4 of hind wings was absent. It is really present, but so long stalked with 3 as to be almost on the margin of the wing, and I overlooked it. Male antennæ pectinate.

NOTES ON SOME NEW MEXICO BUTTERFLIES.

BY T. D. A. COCKERELL, N. M. AGR. EXP. STA.

Lemonias Duryi, Edwards.—I have before me a ♀ taken by Mr. S. Macgregor in 1898 between Mesilla Park and the Organ Mts., N. M.; that is, in the exact type locality of the species, originally collected by Mr. Dury in 1881. The specimen expands an inch and a half, and is thus larger than Dury's, but is otherwise the same. I do not know why Dr. Holland states (Butterfly Book, p. 230) that the ♀ *L. Duryi* figured by him is the only one known; Dury took several, and Edwards described from both sexes.

Anosia strigosa, Bates.—A beautiful specimen of this insect was taken (1898) by Mr. S. Macgregor close to Little Mountain, Mesilla Valley, N. M.

Heterochroa (or *Adelpha*) *californica*, Butler.—This beautiful butterfly is common in the Organ Mts., N. M., a more eastern locality than any I find recorded for it.

Satyrus Meadi, Edw.—Fillmore Canon, Organ Mts., N. M., Aug. 29; collected by Prof. C. H. T. Townsend.

Neonympha Henshawi, Edw.—This is rather common at Dripping Spring, Organ Mts., N. M., 5600 ft., and I took it on Tuerto Mtn., near Santa Fé, Aug. 7, at 8875 ft. Thus it has a vertical range of at least 3275 ft.

Melitæa chara, Edw.—Common flying in a grassy spot near the western base of the Organ Mts., N. M., 1898. (Ckll. and S. Macgregor). This is an austral representative of the subalpine or subboreal *M. minuta*, the latter flying at much higher altitudes. *M. chara* has hitherto been reported only from Arizona.

Chloripe montis, Edw.—Common on the western side of the Organ Mts, N. M., at about 5000 ft., in the neighbourhood of *Celtis* bushes. This is the Upper Sonoran representative of the Lower Sonoran *C. antonia*. The Organ Mt. examples are strongly fulvous above, not pale ashen-gray as Holland (Butterfly Book, p. 190) has it. Edwards (Papilio, Vol. III., p. 7) states that his types of *montis* were fulvous above. All that I have seen have the ocellus in the lower median interspace blind, while that in the upper has a white spot.

Phyciodes nycteis, Dbl. and Hew.—Taken by Prof. E. O. Wooton, on Ruidoso Creek, N. M.

Eresia texana, Edw.—Dripping Spring, Organ Mts., N. M., 5600 ft., April 20. (Ckll.)

Catopsilia sennæ, L.—Mesilla Valley, N. M. Mr. S. Macgregor took a ♀ var. *orbis*, Poey, near Little Mountain. The varieties named *orbis*, Poey; *pallida*, Ckll.; *hyperice*, Sepp., and *pomona*, Donov., appear to be practically identical.

Euchloe Reakirti, Edw.—I took a ♀ of this at Dripping Spring, Organ Mts., N. M., April 24. The lower wings are delicately suffused with lemon-yellow, showing some transition towards *stella*, but in all other respects the insect is true *Reakirti*. The insect has hitherto, I believe, only been found in California.

Lycæna acmon, Dbl. and Hew.—This species has a vertical range of at least 6000 ft.! At Mesilla Park, N. M., I bred it from *Astragalus Wootoni*, Sheldon.

Thanaos clitus, Edw.—I saw, but failed to capture, an example of this beautiful species at the western base of the Organ Mts., N. M., at the end of August. My recollection of it accords exactly with the figure in Dr. Holland's "Butterfly Book."

The following 14 species were collected by Mr. W. J. Howard in Grant Co., N. M.:

Satyrus alope, race *nephele*, Kirby.— ♀. Similar to fig. 4, Pl. XXVI., of Holland's "Butterfly Book," except that there are three of the minute ocelli on the under side of the secondaries. This really belongs to Edwards's race *olympus*, by its locality and comparatively pallid colour; but the ocelli on the primaries are much larger than in Edwards's fig. 6, Pl. III., of *Satyrus*.

Melitæa leanira, race *fulvia*, Edw.—In the specimen before me, the secondaries beneath are yellowish-white with black markings, instead of "yellow-buff," but they may have faded. There is much resemblance to the Californian, *M. Wrightii*, as figured by Holland, but there is not the fulvous at the base of the primaries, and the secondaries beneath are not so heavily marked in our insect.

Melitæa thekla, Edw.—One specimen. *Euvanessa antiopa*, L.; *Pyrameis cardui*, L.; *P. huntera*, Fab.; *Euptoieta claudia*, Cram.; *Synchloe lacinia*, var. *crocale*, Edw.; *Anosia archippus*, Fab.; *Meganostoma cæsonia*, Stoll.; *Colias eurytheme*, Boisd.; *Terias mexicana*, Boisd.; *T. nicippe*, Cram.; and *Heterochroa californica*, Butler.

A CLASSIFICATION OF THE NORTH AMERICAN MYRMELEONIDÆ.

BY NATHAN BANKS, WASHINGTON, D. C.

Some time ago in examining our species of ant lions I noticed that our two large genera, Myrmeleon and Brachynemurus, could readily be separated by the position of the origin of the radial sector; in one much nearer to the base of the wing than in the other. The characters previously used for Brachynemurus, as the forked costal veinlets, the length of the tibial spurs, etc., had not been satisfactory; and the discovery of this distinction led me to examine the other forms of the family with a view to their better classification.

It is evident that the double series of costals is not in itself of generic importance, for in Maracanda one species has a double series, and another species, closely allied, but one series; and, more than this, there are numerous gradations. The use of the tibial spurs, or, better, the length of the first tarsal joint, differs so much in species that appear otherwise closely allied that I cannot see how it can be of generic value. Yet definite differences in this matter, taken in conjunction with other important characters, may well serve to distinguish genera.

In applying the characters I have put chief rank on the origin of the radial sector. This point is best brought out by comparing the ending of the anal vein with the origin of the first fork of the radial sector. This divides the family, as represented in our fauna, into two groups, each of four genera. By such a division I was surprised to see that Myrmeleon was more closely allied to Acanthaclisis than to Brachynemurus, yet such a relation is sustained by many other characters.

Myrmeleon ingeniosus has long been recognized as differing considerably from the other species of Myrmeleon, and for it I have erected a new genus. Some might think that *Brachynemurus longipalpis* would also form a new genus, but it differs in no important character from other species of Brachynemurus, except the long palpi. There are other important structural variations in this genus; for example, the origin of the radial sector in the hind wings, and the amount of elevation of the vertex. Some specimens of *B. abdominalis* have an elevated vertex, but many Eastern examples have a very low vertex and more prominent eyes. But these variations, though very remarkable, do not appear to indicate specific differences.

TABLE OF GENERA.

1. Anal vein of fore wings ends much before the origin of the first fork of radial sector, often before the radial sector itself; six or more transversals basad of the radial sector; pronotum broad (*Myrmeleoni*) 2.

 Anal vein of fore wings ends as far out or often farther than the origin of the first fork of radial sector, usually less than six cross veins basad of radial sector; pronotum often more slender (*Dendroleoni*) 4.

2. Legs very short and stout, very hairy; tarsus I. much shorter than tibia I., large species *Acanthaclisis*.

 Legs much more slender, not very hairy, tarsus I. scarcely shorter or usually longer than tibia I., usually smaller species 3.

3. Spurs on leg I. scarcely longer than first tarsal joint; in hind wings usually three or four cross veins basad of radial sector; tarsus I. about as long as tibia I.; hind wings quite narrow, without large spots *Myrmeleon*.

 Spurs on leg I. as long as first three tarsal joints; in hind wings usually but one cross vein basad of radial sector; tarsus I. shorter than tibia I.; hind wings quite narrow, without large spots *Psammoleon*.

 Spurs on leg I. as long as first two tarsal joints; in hind wings about two cross veins basad of radial sector; legs very slender; tarsus I. shorter than tibia I.; antennæ very slender, scarcely clavate; hind wings broad, with large spots *Glenurus*.

4. No tibial spurs; first tarsal joint of leg I. as long as next two; in hind wings the cubital fork runs parallel to anal for some distance *Maracanda*.

 Spurs present 5.

5. In hind wings cubital fork is very short, the anal bending down and not running parallel to the fork; usually but one cell crossed basad of radial sector in fore wings; legs very slender; spurs slender; first tarsal joint nearly as long as next three; pronotum slender; wings with large spots *Dendroleon*.

 In hind wings the cubital fork runs parallel for some distance to the anal vein; spurs stouter; legs stouter; no large spots on wings 6.

6. The cells basad of radial sector crossed and irregular; a double series of costals almost to the base; radial sector in hind wings arising before the origin of cubital fork..... *Calinemurus.*

Cells basad of radial sector rarely crossed, not irregular; rarely a double series of costals before the middle of wing; radial sector of hind wings often arising beyond origin of radial sector..... *Brachynemurus.*

Acanthaclisis, Rambur.

Our four species of this genus differ somewhat in structure, yet I hardly think sufficiently for a new genus. In *A. congener* the fork of the cubital does not run into the anal vein of hind wing as in *A. fallax*. The very stout legs are characteristic of this genus.

Myrmeleon, Linné.

In our forms there are two groups of species, those allied to *M. rusticus* and those near *M. immaculatus*. The species are very close to each other and difficult of separation.

Psammoleon, new genus.

One series of costals; radial sector arising near the middle of wing, the anal sector ending before its first fork; seven or eight transversals basad of radial sector in fore wing, but one in hind wings; in hind wings the anal vein runs close to the fork of cubitus and then turns away; hind wings narrow, as long as fore wings; palpi short, last joint of labials swollen; antennæ as long as head and thorax; prothorax about as broad as long; legs rather short and hairy; first tarsal joint of leg I. short, the spurs about as long as the first four joints together.

Type *P. ingeniosus*, Walk.

Glenurus, Hagen.

Our one species, *G. gratus*, is very easily known by its beautiful markings; the slender legs and antennæ readily separate this genus from the others of this section.

Dendroleon, Brauer.

Wings broad near tip, both pairs maculate; anal vein of fore wings ending slightly beyond origin of first fork of radial sector; about four cross veins basad of radial sector; cubital fork of hind wings short, soon bent down to anal vein; prothorax slender; legs very slender, anterior tarsus much shorter than tibia. But one species, *D. obsoletum*, Say.

Maracanda, McLachlan.

No spurs; anterior tarsus about as long as tibia; legs not slender, rather short; anal vein of fore wings ends very much beyond origin of first fork of radial sector; two to four cross veins basad of radial sector; in hind wings the cubital fork runs parallel to the anal vein for some distance; costals single or double. Three species, *M. conspersa*, *signata* and *Henshawi*.

Brachynemurus, Hagen.

Anterior tarsus nearly as long or longer than tibia I.; legs quite stout; anal vein of fore wings ends beyond the fork of radial sector; only three or four cross veins basad of radial sector; in hind wings the cubital fork runs parallel to anal for some distance; first tarsal joint of varying length; costals with some forked before pterostigma, often very few. A large genus, but it does not appear to be naturally divisible. *B. longicaudus* is the type.

Calinemurus, new genus.

Two series of costals nearly to base of fore wings; anal vein of fore wings ends much beyond the first fork of the radial sector; the transversals basad of radial sector being mostly divided; in hind wings the fork of cubitus runs nearly parallel to anal vein for some distance; venation in both wings is rather irregular; palpi short, last joint of labials swollen; antennæ about as long as head and thorax; prothorax longer than broad; legs quite short, anterior tarsus about as long as tibia; spurs as long as first joint. Male appendages long and slender. Type *C. californicus*, Bks. *B. fraternus*, Bks., also goes in this genus, and possibly *B. inscriptus*, Hag. I add the description of an interesting new species of Brachynemurus from New Mexico.

Brachynemurus tuberculatus, n. sp.

♀. Face yellowish, dark brown between antennæ and above, with a narrow line in middle, and one each side extending down towards the clypeus: above on vertex mostly dark, with a pale spot each side behind; antennæ brown, the second joint paler; palpi pale. Pronotum brown, with an indistinct pale stripe each side; thorax brown, a pale stripe on each side in front of the base of the fore wings; a pale spot on middle of hind border of mesothorax; two pale marks near middle of metathorax; pleura brown. Abdomen brown. Legs pale; apical half of femur brown; a brown ring on middle and near tip of tibia; and a broad

brown mark on middle and a small one at tip of tarsus. Everywhere with sparse short white hairs. Fore wings hyaline; veins mostly dark, sparsely interrupted with white, the costals mostly dark, most other veinlets pale, and with a brown dot near the middle of each; a large mark at end of radial sector; along median vein there is a broad dark, almost black, line, occasionally interrupted; at end of cubital vein is an oblique dark stripe; the veinlets near margin of wings are richly marked with dark brown; pterostigma brown basally, yellowish apically, not touching the costa. Hind wings hyaline; veins dark, not marked, except pterostigma fuscous, and a dot at end of radial sector. Palpi rather short; antennæ of moderate length; on vertex there is a prominent conical tubercle each side; pronotum short, broader than long, narrowed in front; mesonotum with each anterior lobe elevated into a conical tubercle; abdomen ♀ shorter than wings; legs rather short, spurs scarcely as long as first tarsal joint. Wings of moderate length, pointed at tips; hind pair narrow, but little shorter than fore pair; two series of costals in fore wings nearly to origin of radial sector; four cross veins basad of radial sector; anal vein ending near middle of hind margin.

Length, ♀: abdomen, 17 mm.; fore wing, 20 mm.

Mesilla, N. Mexico (coll. Morse).

SYNONYMY.

Fam. COCHLIDIONIDÆ, Grote, ex Hübner 1806.
= *Cochlidia*, Hübn., 1806.
= *Cochlidiæ*, Hübn., 1816.
= *Limacodidæ*, Auct., post 1825.
= *Eucleidæ*, Dyar, 1894.
= *Apodidæ*, Grote, 1895.
= *Heterogeneidæ*, Meyrick, 1895.
Family type: Cochlidion avellana (testudo).

Gen. COCHLIDION, Hübner, 1806.
= *Apoda*, Haworth, 1809.
= *Limacodes*, Latreille, 1825.

The above synonymy is proposed as being more correct than the terms employed for the group in current literature. The first plural term is employed by Hübner and should be retained. I cannot find that *Cochlidion* is preoccupied. In any event the correct generic title of the type should be used to form the family name.

A. RADCLIFFE GROTE, Roemer Museum, Hildesheim.

OBITUARY.

Entomologists will learn with deep regret that Mr. HENRY G. HUBBARD died in January last. His papers, such as "The Life History of Xenos," "The Ambrosia Beetles of the United States," etc., will long be remembered, so remarkable are they for their scientific accuracy of observation and their extremely interesting character. The following notice is taken from the Detroit *Journal:*

"Born May 6, 1850, he developed from boyhood a remarkable interest in natural history, and even at an early age showed that fineness and delicacy of observation that distinguished the scientific work of his maturer years.

"After graduating at Harvard, in 1873, he remained in Cambridge as a graduate student in his favourite scientific branches, especially enjoying the friendship and encouragement of Louis Agassiz and Asa Gray. His real life-work began in Florida in 1879, where he soon achieved a wide reputation, both as a practical horticulturist and as a scientific investigator in the economics of orange culture. In fact, his discoveries and inventions can be said to have revolutionized this branch of horticulture. He was in government employ many years of his life as an expert in biology and applied entomology. As a botanist he carried on in his beautiful estate in Cresent City, Fla., an experimental station for the acclimation of West Indian and other tropical plants. Singularly gifted in that indefinable quality which we call magnetism, he could interest the most indifferent by accounts of his work and discoveries, or if the talk was in a lighter vein, his uniform gaiety and originality lent a charm to his most careless utterances.

"As a contributor to the advancement of science, his forte lay in a field peculiarly his own—a field where keenness and delicacy of observation were all-important. His papers read before scientific clubs and associations were models of fine scientific treatment and also unusually interesting to the general public.

"Lovely in character and a true idealist as man of science or man of affairs, he lived a life equally noble and unselfish.

> "'He scarce had need to doff his pride or slough the dross of earth,
> E'en as he trod that day to God, so walked he from his birth,
> In simpleness and gentleness and honour and clean mirth.'
>
> "T. H. P."

Mailed March 6th, 1899.



A SERVICEABLE INSECTARY.



A SERVICEABLE INSECTARY

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A SERVICEABLE INSECTARY.

BY F. M. WEBSTER, WOOSTER, OHIO.

With the constantly increasing activity in applied entomology in America, the necessity for rooms or apartments especially adapted for the study of the development of insects is becoming each year more imperative. The insectary has, in fact, become almost as necessary to the working entomologist as has the laboratory to the chemist. While it is especially true in entomological investigations that one must "study nature where nature is," it is equally true that one cannot, in all cases, watch with the necessary care and constant application in the fields that he will be able to do in a fairly well equipped insectary. Not only can forms be transported thousands of miles while in an inactive state and their development watched at close range, as it were, but eggs and larvæ may be brought in during late autumn or winter and studied through their various stages, frequently long before they have appeared outside; and in cases of uncommon or unfamiliar forms this will give the investigator a vast amount of information that he can use to great advantage when the species appears in the fields under a natural condition, perhaps months later.

In the following it is not the intent of the writer to present an illustrated article on a "model" insectary, but to describe one that is in actual use, and the evolution of which has been the direct result of that mother of all invention — necessity. When any demand for certain facilities in order to study any particular species of insect has arisen, and this has constantly been the case, the ingenuity of myself and my assistant has been drawn upon to devise the best methods of accomplishing this end, and thus our insectary at the Ohio Agricultural Experiment Station has come into existence. The only object in presenting this paper is to place in the hands of working entomologists some ideas in regard to an insectary and its equipment, from which they can deviate as their position and requirements may demand. In other words, it may be used as something to work from in their efforts to get that which will best suit their requirements.

The insectary proper is constructed much after the plan of an ordinary greenhouse, the walls being made of hollow tile, and the movable sashes in the roof, for ventilating purposes, are enclosed in dormer-like, wooden frames, covered with swiss or a very thin cotton sheeting in order to prevent the introduction or escape of the most minute insects. A door at one end opens into a workroom, while a window in the roof at the other end is provided with a protected, movable sash like those previously mentioned.

Along three sides extends a bench, such as are in use among florists, except that, in this case, it is only about 30 inches in width, to facilitate the close examination of objects at the far side. A portion of the central space is occupied by a reservoir, and originally we had here also a wider bench.

Wooden benches were tried at first, but these soon decayed, while, as is well known, the larvæ of many species remain long in the earth and to disturb them is fatal, so we were obliged to cast about for something more stable to meet these requirements. We are now using, with apparently perfect success, a bench the construction of which is shown in Plate 3 The bottom is of ordinary stone flagging, two inches in thickness, and supported on a framework made of ordinary gas pipe. The upper side of this flagging is deeply grooved, about an inch from the edge, along each side. For the back of the bench ordinary roofing slate is used, the lower edges being fitted into the groove in the stone and embedded in cement, while the upper edges are held in place by a cap of galvanized iron running along the entire length. For the front a heavy galvanized sheet iron is used, the lower edge, as with the slate, fitting into the front groove in the flagging, while the upper is drawn over and turned under the smaller, horizontal gas pipe, the latter being held in place by a T joint, all of which is shown in the background of Plate 3. Before filling the benches, the inside of this galvanized iron front is coated with asphalt.

The wider, central bench was discarded altogether and the space enclosed by a low brick wall plastered with cement. This enclosed space is filled with earth and will accommodate shrubs and even small trees.

The finished benches, with the whole apartment in actual service, are shown in Plate 4. Formerly we placed soil in the breeding cages, and grew, or tried to grow, the food plants of whatever insects we

happened to be studying therein, but the plants seldom thrive well under such conditions, and the effect on the insects feeding thereon is unsatisfactory and in many cases fatal. Especially is this true where it becomes necessary to transplant from out of doors, as it frequently occurs that we wish to transfer a plant with the larvæ feeding upon it to a position that will enable the movements of the latter to be carefully studied. Under the new arrangement we can either grow the food plant in the benches or transplant it from the garden or field, place our insects upon it, and cover it with a breeding cage, thus eliminating to a considerable extent the objectional features of the old method. Or if we find an insect attacking a plant out of doors we can place one of the cages of the pattern that we are now using over the plant, and pushing the metal base into the soil deftly inclose the whole within our cage without in the least disturbing the insects that we wish to study under the most natural conditions possible.

The breeding cage now in use is shown in Figure 25 and also in Plate 4. It consists of a wooden frame of four upright pieces supporting a wooden top and with an upper base also of wood. Three sides are covered with swiss drawn tightly and fastened along the edges by means of galvanized iron strips about one-fourth of an inch in width, and these are in turn fastened to the wood by tinned staples, such as are used in laying carpets and matting. The remaining side is of glass, which is raised and lowered as required, and works in vertical grooves. By using galvanized iron strips and tinned staples the rusting out of the swiss or other cloth covering is avoided. The lower base is also of galvanized iron, and is shown in Figure 26, as is also the wooden bottom which fits inside of this, and can be used when needed, and when not may be readily removed and laid aside, as it is fastened in place by screws. When used without the bottom it is only necessary to place the cage over the plant or plants and press it down until the metal portion is sunk

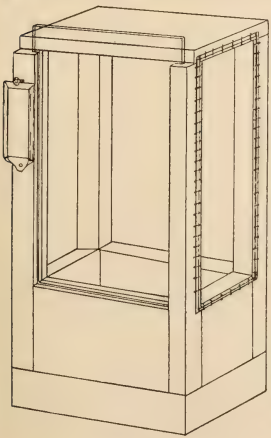


FIG. 25.

into the soil. The cage can be used out of doors as well as in the insectary, and without materially affecting the plant or disturbing the insects feeding upon it. When used with the wooden bottom the metallic base raises this above the damp soil, thus preventing the decay of the lower portion of the cage.

But "one supply reveals another want," and we soon found that there was a need of some method of keeping our notes and records conveniently attached to the proper cage to which they belonged, as well as to protect them from being wetted whenever the benches were wet down with the hose. This led to the use of a holder of galvanized iron with a sliding glass front, fastened to the cages as shown at the left in Figure 25, and also in actual use on the cages in Plate 4. The holder is two by three inches, the sides turned over, and one end over these, while the other end is left a little longer and rounded, with a small hole to pass over a small nail or brad, while the other end is held by a small screw-eye, such as are used on picture frames to which to attach the ends of the cord or wire. The note sheet is folded the proper size and placed in the holder, and the rather close-fitting glass slide pushed in over it. The sheet is so folded that all of the notes will come on the same side, and each space or page is consecutively numbered, and, being all of a uniform size, these sheets when filled or the record finished, can be filed away for permament preservation. This holder cannot easily become detached from the cage to which it is fastened, the notes are preserved from being injured by wet, the galvanized iron does not rust them, and the last record can always be seen through the glass cover without removing it from the cage. With slight modifications, this holder can also be used out of doors on shrubs and trees. For this purpose, what shows as the lower end in Fig. 25 is cut square off and a similar triangular piece is soldered to the back of the upper end to accommodate a fine wire which is used not only to attach the holder to the object, but the end running downward along the back is hooked over the lower end of the holder, thus effectually preventing the glass slide from being shaken out by the action of the wind. On cages outside, it is of course used in the same way as in the insectary.

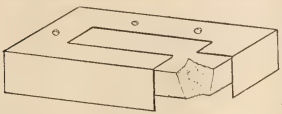


Fig. 26.

SIX NEW OTTAWA PROCTOTRYPIDÆ.

BY W. HAGUE HARRINGTON, F. R. S. C., OTTAWA.

The following descriptions of species which appear to be additions to our fauna were prepared more than a year ago, but were withheld in the hope that more material might be obtained last season. That hope was, however, not fulfilled; largely, perhaps, be it confessed, through lack of sufficient perseverance on the part of the writer in collecting:

1. LYGOCERUS PALLIPES, n. sp.

♀.—Length 1.5–2 mm. Black, finely punctulate and sparsely pubescent. Mandibles and palpi yellowish; antennæ black, except the scape at base and beneath; scape stout, first joint of flagellum about half as long as scape, second as long as pedicel, remaining joints subequal. Legs, including coxæ, yellow. Wings subhyaline, stigma large, yellow. Abdomen stout, pointed at tip.

♂.—Antennæ with joints three to seven dentate; joints eight and nine broadened, two terminal joints slender.

Described from two females and one male captured near Hull, Que., on 2nd, 7th and 14th August, 1897.

2. CERAPHRON CRASSICORNIS, n. sp.

♀.—Length 2 mm. Honey-yellow, finely pubescent and closely finely punctate. Head large, transverse; face not deeply excavated; vertex with impressed line; ocelli black, in very small triangle; antennæ much incrassated, black, except base of scape, which is honey-yellow; scape stout, reaching above ocelli, tapering from base to about middle; pedicel short, first joint of flagellum twice as long and much stouter, second joint less than one-half as long as first, joints three to seven subequal, slightly larger than thick, last obconic not much larger than preceding. Thorax with distinct median furrow; the sutures at base of scutellum with large punctures; posterior margin of scutellum and the postscutellum black, the latter with a strong truncated spine; pleura transversely striated. Legs rather stout, entirely honey-yellow. Wings narrow, abbreviated, reaching only to middle of first abdominal segment. Abdomen stout, acuminate at tip, which is brownish dorsally; first segment with deep and long striæ, black on anterior margin.

This is a large and very distinct species, of which only one female has as yet been taken.

3. Aphanogmus salicicola, n. sp.

♀.—Length 1.5 mm. Black shining, but with head and thorax microscopically punctate. Thorax strongly compressed laterally, not more than one-half as wide as the large transverse head. Face polished; antennæ clavate, with scape and flagellum piceous, outer joints of club black; first joint of flagellum as long as pedicel; second shorter; three to five small, transverse; six and seven enlarged, subquadrate; terminal joint stout, longer than the two preceding, and rounded at apex. Legs piceous, with the tarsi pale. Mesothorax with hardly perceptible impressed line; pleura polished; scutellum elongate and constricted at base, tip slightly projecting; tegulæ black; wings faintly yellowish, costa brownish, stigmal vein yellow, almost twice as long as marginal, oblique, slightly curved at outer end. Abdomen short.

♂.—Antennæ about as long as body, pedicel short and stout, first joint of flagellum twice as long, second slightly shorter than first, joints three to eight about one-half shorter and gradually stouter, last joint elongate oval as long as first; basal joints subpedicellate with long hairs.

Described from one female and two males bred from galls of a Cecidomyiid, on willow.

4. Teleas canadensis, n. sp.

♂.—Length 1.7 mm. Black. Front smooth; orbits with fine striæ, cheeks and lower portion of face striated, clypeus transversely striated; a finely punctured band behind the ocelli, occiput smoother, margined; mandibles stout, rufous. Antennæ about as long as the body, moderately stout and finely pubescent; scape reaching to ocelli, pedicel scarcely longer than thick, first joint of flagellum more than one-half as long as scape, second slightly shorter, remaining joints subequal, about one-half as long as first. Mesonotum at sides and base longitudinally striated, smoother medially, with some large scattered punctures, suture at base of scutellum crenate, scutellum rugosely sculptured, spine short and horizontal; tegulæ piceous, wings subfuscous, legs piceous, femora and coxæ darker, trochanters, knees, and tibiæ rufous; pleura striated and rugosely sculptured, the mesopleura smoother centrally. Abdomen short, first and second segments striate, third finely aciculated basally, irregularly longitudinally punctured toward apex.

One male taken at Hull, Que., 26th August, 1894.

5. Baryconus cinctus, n. sp.

♀.—Length 1.8 mm. Black, with third abdominal segment and the legs rufous or yellowish. Head and thorax closely punctulate and almost opaque; face polished, with a delicate central carina; lower cheeks and face below antennæ with striæ converging to mouth; mandibles yellowish, palpi white. Antennæ black, except base of scape, which is rufo-piceous; pedicel small, first funicular joint twice as long as pedicel, second one-third shorter than first, third as long as pedicel, fourth small, subquadrate; club compact. Mesonotum without furrows; mesopleura with striæ converging toward pectus; metathorax rugosely sculptured. Wings hyaline, pubescent; marginal vein thickened, as long as stigmal. Legs, including coxæ, honey-yellow; the anterior coxæ varying to subpiceous. Abdomen subfusiform, longer than thorax and head, black at base and apex; third segment and part of second rufous; horn reduced to a polished convexity; first and second segments coarsely striate; remainder of abdomen closely finely punctulate.

Described from three females captured 19th and 29th August, 1894, by sweeping the low herbage of sandy pastures within city limits of Ottawa.

Superficially this species resembles *Opisthacanta mellipes*, Ashm., but is readily distinguished by the absence of mesonotal furrows and of the metascutellar spine.

6. Baryconus bicolor, n. sp.

♀.—Length 1.8 mm. Honey-yellow, with black head. Vertex finely punctulate, face polished, lateral ocelli almost touching eyes, mandibles and labrum pale. Antennæ with scape and pedicel pale yellowish, the latter small, hardly longer than thick; funicle and club black; first funicular joint twice as long as pedicel, second one-third shorter, third as long as pedicel, fourth small transverse; club consisting of six joints subequal in length. Mesonotum punctulate and pubescent, with faint furrows. Wings faintly yellowish, pubescent, with long ciliæ on costal margin; usually hardly reaching to apex of third segment of abdomen, but in one specimen more fully developed and extending almost to tip of the abdomen. Legs yellow, the knees sometimes darker. Abdomen longer than head and thorax; first and second segments striate, third segment almost quadrate, very highly polished, but faintly microscopically punctate, as are also the terminal segments, which, however, are more opaque.

The apex of the horn, which is not prominent, is always black, as are also the apical segments, including about half of third segment.

♂.—Closely resembles ♀ in coloration. Scape and pedicel pale, the latter short, first funicular joint fully twice as long; second, third and fourth shorter, remaining joints subequal with the first, except the terminal joint, which is slightly longer and slenderer.

Described from nine females and five males captured with the preceding species. They were taken by sweeping the grass around open sandy patches, intermixed with some small, closely-cropped raspberry bushes. Although apparently abundant on that occasion, I have not since been able to obtain the species.

This insect resembles a small *Caloteleia Marlattii*, Ashm., but the head is always entirely black, and the antennæ in both sexes are very distinct from those of that species; in the ♂ they are much more slender, with the joints more elongate.

THE NORTHWEST (CANADA) ENTOMOLOGICAL SOCIETY.

All entomologists in the Eastern Provinces of Canada will assuredly be gratified to learn that an Entomological Society has been formed, and is in active operation, in the "Northwest." The following are the officers:

President, - -	Percy B. Gregson, Esq.
Vice-President, -	Rev. Edward John Chegwin, B. A.
Librarian-Curator,	Arthur Douglas Gregson, Esq., J. P.
Treasurer, - -	Percy B. Gregson, Esq.

Among the members may be mentioned: Mr. James J. Brewster, Banff, Alberta; Mr. W. A. Brewster, Edmonton, Alta.; Frank Oliver, Esq., M. P., Edmonton; T. N. Willing, Esq., Olds, Alta.; Right Rev. the Bishop of Calgary and Saskatchewan; John A. Simpson, Esq., M. L. A., Innisfail, Alta.; F. H. Wolley Dod, Esq., Calgary; A. G. Wolley Dod, Esq., Secretary of the Fish Creek Agricultural Society; Dr. H. George, Vice-President of the Innisfail Agricultural Society; Wm. Posthill, Esq., J. P., Vice-President of the Red Deer Agricultural Society; John J. Young, Esq., Editor of the *Calgary Herald;* James H. Tomlinson, Esq., and about thirty-five others who are engaged in agriculture. The labours of the Society are to include Botany, Geology and other branches of Science, as well as Entomology. Communications should be addressed to the President, Waghorn P. O., Alberta.

THE COLEOPTERA OF CANADA.

BY H. F. WICKHAM, IOWA CITY, IOWA.

XXXII. Supplementary Remarks to Earlier Papers.

The following notes relate in large part to additions recently made to the Canadian fauna through the activity of collectors in the Dominion. Several species which their possessors were unable to identify by means of the tables have been submitted to me, and, proving new to the Canadian lists, are incorporated in these pages, that students may have access to the descriptions. The families are taken up in the order of their treatment in the Canadian Entomologist.

Coccinellidæ.

In this family a great number of additions, comparatively speaking, have been made. Some of these are first recorded in Dr. Horn's memoir, entitled "Studies in Coccinellidæ," published in Trans. Am. Ento. Soc., Vol. XXII. Among them may be noted *Smilia misella* and several species of *Scymnus*.

Smilia is substituted for *Pentilia*, hitherto employed in our lists; and the Canadian species, *S. misella*, Lec., is the smallest Coccinellid known from the region, measuring only .04 inch in length. It is shining black, not pubescent, convex, prothorax a little narrower than the elytra, smooth, sides not explanate. Elytra distinctly punctured, suture finely margined. Behind the front angles of the prothorax is an indistinct obliquely impressed line. Dr. Leconte states that it is sometimes abundant on flowers of *Thalictrum*. It is more than probable that *S. marginata*, Lec., will also be found in Canada, in which case it may be recognized by the obliquely impressed thoracic line being distinct and the surface punctate. Both are about the same size.

In the genus *Brachyacantha* I have received two species not hitherto recorded from Canada. Mr. John D. Evans sent a specimen of *B. 4-punctata*, Melsh., taken in Eastern Ontario. Without reference to the generic characters this insect would probably be placed in *Hyperaspis*, but the anterior tibiæ have a spine on the outer margin. It is about the size of *B. ursina*, black, the tibiæ and tarsi pale. Each elytron bears two round reddish or orange spots, one basal, one subapical; these spots being separated from the suture by a space about equal to their own diameters. The male has besides a narrow anterior thoracic marginal line and humeral elytral spot yellow. From Mr. R. J.

Crew I have *B. dentipes*, Fabr., captured at Toronto. It is larger than the foregoing, reaching sometimes a length of .22 inch or more. Colour black, legs wholly or in part pale, head either black with yellow frontal spot (♀), or yellow (♂); the thorax has the sides broadly marked with the latter colour. Elytra with a broad orange or yellow band slightly before the middle, extending from the outer margin nearly to the suture, while near the tip is a rounded spot of the same colour. The markings are variable in extent, but the above description applies to the Canadian form (see Fig. 27).



Fig. 27.

In my paper on Coccinellidæ (number V. of this series) the genus *Scymnus* was not tabulated out, as the species were very poorly determined in collections, and Dr. Horn had just begun the study of them with a view to revision. A short time before the appearance of his paper (cited above) he kindly sent me a synopsis of the Canadian forms known at the moment, and this, with some changes and additions, I append below.

Most of the *Scymni* are broadly oval in outline and quite convex, giving them a nearly hemispherical appearance. A few are more elongate, and present a broken outline at the point of meeting between the prothorax and elytral humeri. All are pubescent. They are found by beating and sweeping during the warm months, while in spring and fall they may be captured on the under sides of stones or of pieces of wood in grassy spots.

Before attempting to trace the species through the use of a table, the student should familiarize himself with the structure called the metacoxal line. This is situated on the first ventral abdominal segment, appearing in most species as a fine raised line, describing a curve or arc behind the posterior coxal cavity, reaching from the inner border of the coxal to the neighbourhood of the outer anterior angle of the segment. It is very readily seen by means of any fairly good hand lens, but it is often necessary to move the hind leg on one side, so that the knee is directed straight backwards, otherwise the structure is obscured or covered up.

Perhaps the reference of *S. terminatus* to Canada may be open to doubt, but since the record is existent I have included it in the table.

A. Metacoxal line not forming a complete arc, either joining the first ventral abdominal suture, or running parallel to it outwardly.

b. Elytra with one or more yellowish spots.

Form oval. Head black or yellowish, thorax black, sides and front margin sometimes yellowish, tibiæ and tarsi always so. Elytra black, with an oval yellow spot on each, one-third from apex, equally distant from side and suture. .06–.08 in..... *flavifrons*, Melsh.

Form elliptical. Blackish, each elytron with two obliquely oval yellowish spots, sometimes coalescent. Legs reddish. .08–.09 in..... *ornatus*, Lec.

bb. Elytra not spotted, but with apex yellow, this colour extending one-fourth or one-fifth along the suture. General colour piceous, head, legs and thoracic margin yellow, abdomen usually so, two basal segments sometimes dark. .06–.075 in..... *terminatus*, Say.

AA. Metacoxal line forming a complete arc, beginning at the inner edge of the hind coxal cavity, thence describing a curve and ending nearly at the anterior angle of the segment.

c. Form broadly oval, outline of sides of thorax with humeri nearly continuous. Elytra never with discal spot, apex often yellow.

d. Elytra pale at apex, sometimes narrowly so.

e. Apical pale space of elytra about one-fifth the length of the suture. Head yellowish, thorax piceous, with a very wide yellow margin. Elytra black, except as stated; abdomen piceous, paler at sides and tip; legs reddish-yellow. .08 in..... *fraternus*, Lec.

ee. Apical pale space narrow.

f. Thorax partly black above.

Colour black, sides of thorax yellowish, less broadly than in the next species. Elytra with narrow apical pale space, abdomen often indefinitely paler at sides and tip, legs pale, femora more or less piceous. First ventral of male with median smooth area surrounded by short pubescence. .08–.10 in..... *puncticollis*, Lec.

Resembling the preceding species, head and thorax yellow, the latter with median basal spot of variable size. Legs reddish yellow, femora not piceous. First ventral of male without median smooth space. .08–.09 in. *collaris*, Melsh.

ff. Thorax entirely yellowish above, prosternum partly yellow. Head, tip and often also the sides of abdomen, with the legs, of the same colour, rest blackish.
.06–.09 in..... *cervicalis*, Melsh.

dd. Elytra entirely black. Thorax without yellow margin, tibiæ and tarsi usually pale, femora more or less piceous.

Size moderate, metacoxal line at apex of curve nearly reaching the suture between first and second ventrals. .08–.10 in..... *lacustris*, Lec.

Size small, metacoxal line forming an arc, scarcely half as long as the first segment of abdomen.
.05–.06 in..... *punctum*, Lec.

cc. Form oblong oval, more than one-half longer than wide. Thorax narrower than elytra. Sides nearly straight, except near front angles, where they are arcuate. Black, each elytron with a small oval reddish spot near centre, sometimes wanting. Legs dark. .06 in... *punctatus*, Melsh.

The name *hæmorrhous* does not occur in the above table, since it is considered a synonym of *fraternus*. The spotted species, *ornatus*, *flavifrons* and *punctatus*, are quite rarely seen in collections.

Formerly the specimens of *Coccidula* from both sides of the continent were referred to *lepida*, Lec., as it was thought that the difference in colour was merely varietal in character. However, Dr. Horn has separated them as follows, both species being yellowish-red (or a bleached derivative) above, and piceous below, with the markings now described. The head is piceous, the legs yellowish.

Elytra with basal transverse piceous band, which joins at the humeri with a lateral stripe of the same colour reaching about two-thirds to apex. Suture with a blackish stripe connecting the basal band with a cordiform spot which is situated one-third from apex, .12 inch. This is

the Western form, found in Vancouver Island and British Columbia. It has the first two abdominal segments piceous, the rest yellowish, and is the species which I incorrectly called *lepida* in my paper (Can. Ent., Vol. XXVI., p. 305).....*occidentalis*, Horn.

Elytra as in preceding, except that there is no sutural stripe connecting the basal band with the spot, which is transversely oval, not cordiform. The middle portions only of the first and second ventrals are piceous. Size of the other species. Found in the Eastern Provinces.....*lepida*, Lec.

ENDOMYCHIDÆ.

Quite recently I have received from the Rev. Geo. W. Taylor, a number of specimens of *Aphorista læta*, Lec., a most beautiful insect of this family. He took them at his home near Nanaimo, Vancouver Island. It is more than likely that the insect will be found also on the mainland of British Columbia, and the following description will render it easy of recognition, since the form is unmistakable and closely resembles that of the other species of this and allied genera. It is .28 inch. long, yellowish-testaceous, antennæ blackish, terminal joint more or less pale. The prothorax bears two small black spots, one on each side before the middle, and the elytra have a very large common blue spot which covers most of the surface, leaving only the humeri, side margins and apex pale. It is shown in Fig. 28.



FIG. 28.

Another nice species has been sent for determination by Mr. John D. Evans, who took it in Eastern Ontario. It is *Mycetina testacea*, Ziegl., a small, yellowish-testaceous beetle, of more elongate form than either *perpulchra* or *Hornii*. The antennæ are piceous, but otherwise the colour is quite uniform—aside from a tendency of the sides of the prothorax to become a little paler than the disk. It is distinctly shining above, notwithstanding the covering of yellow pubescence. Length, .15 inch. Mr. Evans writes that he has only a single specimen, taken near Trenton in 1884.

The style of coloration (by lack of all pattern) is so different from that of *M. Hornii* and *M. perpulchra*, the previously-known northern forms, that the present species would not fall into the genus (nor any of the other genera) by the scheme which I used in the generic synopsis on

p. 338 of the CANADIAN ENTOMOLOGIST, Vol. XXVI. The fault may be corrected by changing the wording of the division "ccc" so that it may read "Thorax reddish or testaceous, elytra entirely testaceous or black, with two reddish spots on each."

CHRYSOMELIDÆ.

Mr. R. J. Crew has collected, at Toronto, two species of *Zeugophora* not included in the Society's lists nor in my paper. Since these additions *(Z. Kirbyi* and *Z. scutellaris)* raise the total number of Canadian forms to five, it will be as well to reproduce in part the table recently published by Dr. Horn in Trans. Am. Ento. Soc., XIX., which runs thus:

A. Body, as seen from above, of one colour.

Pitchy black *abnormis*, Lec.

Entirely yellowish *Kirbyi*, Baly.

AA. Body above bicoloured.

b. Elytra entirely black. Head entirely yellow, punctures of elytra large and more distant than their diameters..... *scutellaris*, Suffr.

bb. Elytra parti-coloured.

Thorax entirely yellow, elytra with a cordiform discal space, the suture narrowly and the side margin yellow. outer half of antennæ piceous, the elytral punctures very close *puberula*, Cr.

Thorax with a discal piceous area divided at middle by a yellow line, elytra with a common oval or cordiform spot and the apex pale. Antennæ pale.. *varians*, Cr.



FIG. 29.

All the species are of nearly the same size, running from about .13 to .16 inch. in length. The name *Kirbyi* replaces *Reineckei* of the check-list. A figure of *Z. varians* is here given (Fig. 29), which will show the form of the genus.

THE ODOUR OF COCCIDÆ.

BY PROF. W. G. JOHNSON, COLLEGE PARK, MD.

I have been much interested in reading the notes upon the odour of scale insects by Professors Webster and Cockerell in the January and February issues of this journal. During my inspections in orchards and nurseries I have frequently detected the odour emitte by *Aspidiotus perniciosus*, mentioned by Webster, especially where the trees were badly infested, and have wondered what relationship it bore to the species. I have detected the most pronounced odours, however, in the genera Chionaspis and Lecanium. The odour produced by the Euonymus scale, *Chionaspis euonymi*, is very unpleasant to some persons. It is most marked upon badly infested, freshly cut twigs. If they are left in a tightly closed room for a few hours, the air will become very foul. When the scales are scraped or disturbed the odour is very offensive. The foulest of all odours emitted by scale insects, with which I have any knowledge, is that produced by *Lecanium nigrofasciatum*, recently described by Mr. Theo. Pergande (Bul. 18, Div. Ent. Dept. Agr.). It is popularly called the peach Lecanium, but I prefer to call it the terrapin scale on account of its close resemblance to that familiar animal. I am not sure, however, but that the term stinking scale would not be more appropriate, as it is certainly the most nauseating creature I have ever smelt. During the past week I was able to determine, specifically, by the scent with unerring accuracy specimens of this insect upon wild goose plum enclosed in a pasteboard box, wrapped with paper, sent through the mail for my examination, without opening the box. Two years ago I saw a seven-year-old peach orchard in Worcester County containing about 1,500 trees that was very badly attacked by this pest. The orchard was examined in September, and the whole atmosphere at that time was charged with this repulsive odour, which could be detected many rods away. Two other cases came under my observation last fall in the Blue Ridge Mountains, in Washington County. One orchard, eleven years old, containing about 900 peach trees, had become so completely overrun by this insect they were of no commercial value. The most repugnant smell emanated from this orchard that I ever encountered. The other orchard, peach also, contained 600 six-year-old trees, all of which were in the same general condition. When these insects are crushed or rubbed with one's finger the odour is very sickening, and can be detected on one's fingers even after repeated washings.

Whether or not this odour is for the purpose of attracting the male I

am not able to say, but I am inclined to think that it is not, especially in *Lecanium nigrofasciatum*. As this insect reaches considerable size, and remains upon the tree over winter, exposed, as a partially matured creature, it seems to me that the foul smell is for the protection of the species from the attacks of birds. On the other hand, I do not think this theory applies to *A. perniciosus* or *C. euonymi*, as neither of these species are sufficiently large to be attractive or available as food for birds. The odour here, therefore, may be for sexual purposes, or for attracting other insects. The former would hardly seem probable, because the sexes are found upon the same twigs, and we should not suppose the male would have any great difficulty in finding the female.

WEST AFRICAN MOTHS.

In the CANADIAN ENTOMOLOGIST, XXVI., pp. 69, 70, Mr. Geo. A. Ehrmann described as new three West African moths. Very recently this gentleman has been so obliging as to forward his types to me for examination. I should like to put on record a few observations on them for the benefit of students of the African fauna.

1. *Syntomis hilda*, Ehrm.

This should stand *Ceryx hilda* with *seminigra*, Holl., as synonym, and not as it does on page 46 of Hampson's monograph.

2. *Syntomis abdominalis*, Ehrm.

This belongs to the Zygænidæ (by the table of families in Cat. Lep. Phalænæ, I.), and should be erased from page 141 of Hampson's monograph. In Vol. I. of the Moths of India it falls into the genus *Tasema*, Walk., but yet differs obviously from that in wing shape. The fore wings are long, the outer margin very oblique, the hind wings small and narrow, quite characteristically Syntomid, which doubtless explains Mr. Ehrmann's erroneous reference.

3. *Pachypasa Nasmythii*, Ehrm.

This is a true Lasiocampid and falls in the genus *Taragama* by the table in the Moths of India. Female. Fore wings moderately broad, somewhat pointed at the apex, the outer margin oblique. Discal cell of both wings short; fore wings with veins 6 to 8 stalked, 9 and 10 on a separate long stalk; hind wings with vein 3 shortly stalked with 4 and 5; intercostal cell as long as discal cell, separate from it except at basal third, and with one distinct humeral vein in the moderately sized lobe. Palpi just reaching the frontal tuft; antennæ shortly pectinated; hind tibiæ with small terminal spurs.

HARRISON G. DYAR, Washington, D. C.

NEW, OR LITTLE KNOWN, ALEURODIDÆ.—II.

BY A. L. QUAINTANCE, BIOLOGIST, GA. EXPT. STATION.

Aleurodes graminicola, n. sp.

Egg.—Size, .25 x .13 mm.; uniformly brownish in colour; unmarked; oblong, truncate at base; pedicel short, attached to one corner; eggs held nearly upright on leaf by short pedicel and truncated end.

Larva.—Length, .7 mm.; width, .3 mm.; oblong-elliptical in shape; colour, yellowish-white; eye spots reddish. There is a marginal fringe all around of white cottony waxen threads. No marginal rim, and but faint crenulation. In other respects, essentially as in pupa-case.

Pupa-case.—Length, 1 mm.; width, .46 mm.; in shape, oblong-elliptical. Under hand lens, yellowish-brown in colour, with a stripe of dark brown, more or less interrupted, along dorsi-meson. Pupa-case slightly raised from surface of leaf by a vertical fringe of white waxen rods. A rounded keel extends along dorsi-meson, more pronounced caudad. No marginal fringe of wax-rods, as in larva; marginal rim very narrow and indistinct. Outer margin of case rather minutely crenulated, the incisions between the wax tubes shallow and usually acute.

Abdominal segments quite distinct along middle line, but gradually fading towards the margins. Second thoracic segment distinct near dorsi-meson; third thoracic segment distinct, sinuate, extending nearly to margin on each side. A median suture extends cephalad from third thoracic segment to margin of case. On cephalic segment is usually a pair of reddish pigment spots, varying much in position and shape. Dorsum destitute of setæ, except a small seta on each side of vasiform orifice. A pair of well-developed setæ extend caudad from caudal margin of case; also a pair of very minute setæ on caudo-lateral margin, a seta on each side.

On each side of keel, along dorsi-meson, are large depressions or pores, usually a pair to each abdominal segment, situated near cephalic margin of segment. The orifices of these are irregularly toothed or lobed, except on cephalic margin, which is formed by caudal margin of the preceding segment.

Vasiform orifice, cordate, about four-fifths as wide as long; the inner lateral margins are somewhat corrugated. Operculum not quite one-half length of orifice, about two-thirds as long as wide, and covered with minute spines, thicker and longer on caudal margin. Lingula somewhat spatulate, extending about three-fourths length of orifice; thickly set with

short spines, thicker and longer on distal end, where it terminates in two small lobes. From the ventral surface of distal end of lingula arises a pair of upward curving setæ, extending caudad almost to caudal margin of vasiform orifice. On ventral surface, rudimentary feet distinct.

Adult ♂.—About .8 mm. long to tip of genitalia; length of front wing .8 mm.; length of antennæ about .516 mm.; length of hind tibia .3 mm.; length of hind tarsus and claw .166 mm. Body uniformly greenish-yellow; wings immaculate; eyes reddish, distinctly divided, larger part ventrad. Antennæ of seven joints. Joint 1, short, obovate, one-half length of second; joint 2, somewhat club-shaped, and obliquely truncate distally; joint 3, long, cylindrical, slightly longer than 1 and 2 together; joints 4, 5 and 6 together, about equal in length to joint 3; joints 5 and 6, subequal in length, and one-third thicker than joint 4; joint 7, very long and tapering, being about equal in length to joints 3, 4, 5 and 6 together; joints 3, 4, 5 and 6 are rather coarsely ringed, joint 7 minutely spined.

On third pair legs, femur about two-thirds length of tibia; tarsi five-ninths length of tibia. Mentum much reduced, about as long as middle tarsi, excluding claw, slender at base, enlarged distally, and tipped with dusky. Operculum, in dorsal aspect, sub-rectangular in outline, somewhat concave on caudal margin, which is minutely setate. Lingula cylindrical, and truncate distally, but spreading at base, extending caudad beyond margin of operculum, somewhat more than length of operculum. On the truncated end is a group of setæ.

Penis slender, tapering, curved upwards, about two-thirds length of valves; valves rather short, stout, clasping at tip. On last segment of abdomen at base of each valve is a short fleshy protuberance. Wings delicately beaded all around; median vein of fore wing extending nearly to tip of wing; basal veinlet apparently arising free from median vein, extending obliquely to caudal margin.

Adult ♀.—Unknown.

Collected on an undetermined grass, July 24, 1898, at Lake City, Florida, by Prof. P. H. Rolfs.

Aleurodes Rolfsii, n. sp.

Pupa-case.—Length, .72 mm.; width, .45 mm.; varying somewhat; regularly elliptical in shape, raised on vertical fringe of white, waxen rods. Colour, clear whitish, with more or less of brownish frequently along dorsi-meson; the inclosed pupa is yellowish, with eyes reddish. Margin

all around minutely crenulated, the indentures between the marginal wax tubes usually rounded and shallow. There is a very narrow submarginal rim formed by the wax tubes. Marginal fringe wanting. Abdominal segments moderately distinct; a straight mesal suture extends cephalad to margin, from first abdominal segment. Four pairs of browish coloured setæ are usually present near the dorsi-meson; a pair on the prothorax; a pair on first abdominal segment; a pair at vasiform orifices, and a pair on caudal end of case, just within the submarginal rim. The cephalic two pairs are usually smaller than caudal pairs. The caudal pair is well developed, the setæ projecting dorso-caudad some distance beyond case. There is a pair of minute setæ on the margin of case near the caudo-lateral region. Dorsum with numerous pores and papillæ, from which arise long, curved, tapering, waxen rods. The papillæ are in a sub-marginal row all around, rather closely set, there being sometimes as many as fifty. These are somewhat variable in number and position, particularly in the thoracic region, where they may occur quite promiscuously on the dorsum. In the abdominal region they occur in more definite order, where they are in four longitudinal, somewhat curved lines. Those of the mesal two rows occur in pairs, a pair to each abdominal segment, except the last segment, where there may be two or more pairs.

Vasiform orifice pyriform, not quite as broad as long; cephalic margin straight; caudal end with acute indenture and finger-like process. Inner lateral and caudal margins corrugated. Operculum sub-elliptical, broader than long; not quite one-half as long as orifice, minutely spined on caudal margin. Lingula well developed, about three-fourths the length of orifice. Distal part of lingula with three pairs of lateral lobes; minutely spined, except at base, and bearing on distal end from below a pair of setæ, which project caudad just beyond orifice. Rudimentary feet moderately distinct.

Adult ♀.—Length to tip of genitalia about 1.20 mm.; length of front wing, 1 mm.; width of front wing, .41 mm.; length of hind femur, .21 mm.; length of hind tibia, .38 mm.; length of antennæ, about .3 mm. Body stout, light brownish-yellow in colour, with caudal margin of head, and the sutures of thorax more or less margined with brownish; legs and antennæ paler; eyes reddish. Front pair of wings marked with spots of smoky-black. There is a small spot at base, caudad of basal veinlet; two irregular spots near middle of length of wing, one on each side of wing; the caudal spot somewhat V-shaped, with the apex of the V turned

distad; the spot on cephalic side of vein is irregularly rectangular, its inner end touching vein at its caudal flexure. At about distal fourth of wing are three irregular sports in a transverse stripe. The vein terminates in the median spot. When seen under a hand lens, these markings appear as two irregular zigzag lines extending transversely across the wing. When the wings are folded the stripes of one side appear continuous with those of the other side.

Antennæ seven-jointed. First joint short, subconical, about one-half as long as second; second, about one-half as wide as long, truncate distally; third, long, slender, five-sixths length of distal four together; fourth, about three-fourths length of fifth, cylindrical; sixth and seventh, subequal in length; sixth, cylindrical; seventh, swollen, tapering distally, bearing a terminal seta. Joints third and distally, rather closely ringed. Eyes completely divided transversely, the larger division ventrad. Mentum long, three jointed; first joint short, about one-third length of second; second long, being rather longer than third; third usual, tipped with black. Rostrum short, conical, bearing three long setæ. In third pair of legs, femur slender, about two-thirds length of tibia; tarsus and claw together as long as femur. Distal joint and claw of tarsus about as long as proximal joint. Vasiform orifice, as seen in dorsal aspect, subcircular; operculum, slightly convex, with its caudal margin concave; minutely setate on margin; lingula projecting some distance caudad, club-shaped; minutely setate. Main vein of fore wing nearer cephalic than caudal margin, making a bend caudad near the middle of its length. Basal veinlet arises distinct from main vein (possibly connected by cross vein at very base) extending obliquely backwards, reaching margin at about one-third length of wing. Wings all around on the margin delicately beaded. On cephalic margin of hind wings at base are seven to nine setæ.

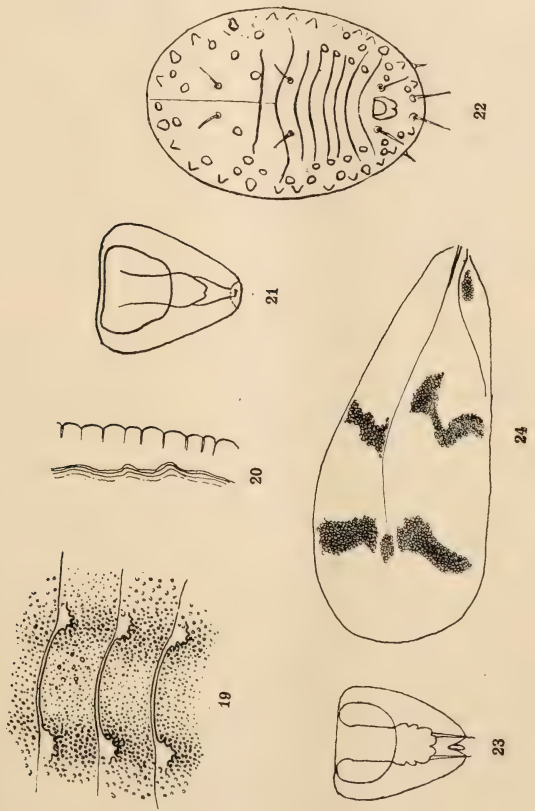
♂.—Length to tip of genitalia about 1 mm.; proportionately smaller than female. Genitalia forcipate, an acute prominent tooth on each valve at base. Penis enlarged at base, tapering and curved upwards, about five-sixths length of valves. In other respects essentially as in female.

This aleurodid was sent in by a correspondent from South Florida, to Prof. P. H. Rolfs, on leaves of cultivated geranium, to which it was regarded as a severe pest.

EXPLANATION OF FIGURES.

Aleurodes graminicola.

Figure 19.—Illustrating pores on third, fourth and fifth abdominal segments of pupa-case.



Aleurodes graminicola (Figs. 19–21); A. Rolfsii (Figs. 22–24).

Figure 20.—Margin of pupa-case.

Figure 21.—Vasiform orifice, operculum and lingula of pupa-case. *Aleurodes Rolfsii.*

Figure 22.—Pupa-case.

Figure 23.—Vasiform orifice, operculum and lingula of pupa-case.

Figure 24.—Wing of adult.

DESCRIPTION OF THE GOPHER MOTH.

BY J. B. SMITH, SC.D., RUTGERS COLLEGE, NEW BRUNSWICK, N. J.

EPIZEUXIS GOPHERI, n. sp.

Ground colour a very pale mouse-gray, the wings with the appearance of being thinly scaled. On the thorax is a slightly warmer, more brown or reddish tinge, while the under side is darker and somewhat more smoky throughout. Primaries with all the lines diffuse and vague, except the s. t., which is distinct and very sharply dentated. The basal line is wanting. The t. a. line is pale, without defined margins, and crosses the wings with scarcely an out-curve. The t. p. line is yet more feebly marked except on the costa, and crosses the wing with a feeble out-curve, a little more marked than the outer margin of the wing itself. In the male this line seems to be better defined than in the female. The s. t. line is whitish, distinct, and irregularly toothed in both directions; that is, inwardly as well as outwardly — as a whole keeping at about the same distance from the outer margin throughout. The ordinary spots are very feebly marked; the orbicular a faint yellowish dot, and the reniform a somewhat larger blotch of the same colour; but in both cases indefinite. The secondaries are distinctly paler, more washed out and becoming almost whitish at the base. Toward the outer margin they are more nearly of the ground colour of the primaries, and here a pale, dentate, submarginal line becomes visible; much less defined, however, than the s. t. line of the primaries. On the under side the fore wings are uniformly smoky gray, without the glossy appearance of the upper side. The hind wings are much paler toward the base, and near the outer margin a faint reproduction of the line on the upper surface is noticeable.

Expands 1.12 to 1.20 inches = 28 to 30 mm.

Habitat.—In Florida; discovered by the late Mr. H. G. Hubbard, in the burrows of the land tortoise *(Gopherus polyphemus)*.

One pair is before me; both specimens received from Mr. Hubbard. The male is somewhat crippled and in unsatisfactory condition, though all parts are present; but the female is in very fair shape and has all the characteristic features well marked. The species differs at once from all the other members of the genus by the strongly pectinate antennæ of the male. In no other of the species have we more than a strong serration, and by this one character the species can be easily distinguished. In, other respects it bears a curiously close resemblance to that western form of the common *lubricalis* which I have named *occidentalis*. With the

females only at hand and without a history of the specimen it would be easy to mistake the new species for the California variety, except for the fact that the s. t. line is unusually sharp and strongly dentate in comparison with the vague suffused markings seen in *occidentalis*. Other structural details of the legs and of the palpi do not differ from the usual form found in the genus, and in the male we have that same peculiar formation of the anterior femur which I described in my monograph of the Deltoids and figured. Concerning the life-history of the species and the habits of the larvæ I refer to Hubbard's articles on the insect guests of the Florida land tortoise published in Insect Life, Vol. VI., No. 4, 1894, p. 305-306, and in Proc. Ent. Soc. Wash., Vol. III., No. 5, 1896, p. 299.

MANITOBA BUTTERFLIES.

I have a further addition to make to my list of the Butterflies of Southern Manitoba, as the result of last summer's work. As in Africa of old, something new seems to be constantly turning up. The scarcity of grass in the usual prairie hay meadows drove me into a small "muskeg" of a few acres in extent, in a corner of the river valley, about a mile from my house. It is a veritable Serbonian bog in ordinary seasons—the grave of many a bison and wapiti, judging from the remains, in days gone by, and which has of recent years taken toll from time to time from our domestic herds. In it, at the end of July and the beginning of August, I took three or four specimens of *Thecla acadica*, and the same number of *Chrysophanus thoe*, and also a variety of *C. helloides*, smaller and more faintly marked than any I have taken before—the large form being generally abundant in certain places.

Butterflies were not plentiful last year, especially during the early summer, through the dry, cold weather that prevailed, but I made one notable addition to my collection. For some years I have been unable to do any "sugaring" during the harvest season, but this year I managed to paint a few trees, with the result that during the day time they were visited by several *Vanessa Californica*, of which I took three ♀s, my previous captures being ♂s, and saw several more. *Grapta progne* and *comma*—both varieties of the latter—also were attracted by the trees, and a very few *atalanta*, but nothing else.

At night, I took several species I have not before seen, and I particularly noted the absence of *Catocalas*. *Relicta* and *unijuga* used to be a positive nuisance, frightening all other species away. This year I did not see a single *unijuga*, only a few *relicta* and *briseis*, but several *concumbens*, which used to be very scarce.

E. F. Heath, Cartwright, Man.

ENTOMOLOGICAL BOOKS.

The following is a copy of the circular recently issued by the Customs Department in order to clear up some uncertainty regarding the interpretation of the circular issued in July of last year. It is now made clear that all books on entomology may be imported free of duty:

Customs Department, Canada.

Ottawa, 13th February, 1899.

To Collector of Customs:

The following memorandum was issued on the 28th July, 1898, to customs ports concerned in the importation of entomological books, viz.:

"I beg to advise you that the Minister of Customs has determined that books on entomology, such, for example, as 'Insects Injurious to Vegetation,' by Dr. T. W. Harris; 'Guide to the Study of Insects,' by Dr. A. S. Packard; 'Insects Injurious to Fruits,' by Dr. Wm. Saunders; 'Manual for the Study of Insects,' by Prof. J. H. Comstock; 'Economic Entomology,' by Prof. J. B. Smith; and 'Entomology for Beginners,' by Dr. A. S. Packard, are entitled to free admission under the provisions of item 464 of the Tariff Act."

You are instructed that free importation of books of the above class is not confined to the special works herein described by name, but that entomological works may be classed as industrial books entitled to free entry under tariff item No. 464.

(Signed) JOHN McDOUGALD,
Commissioner of Customs.

THE ODOUR OF COCCIDÆ.

Apropos of Professor Webster's note, on page 4 of the current volume of the CANADIAN ENTOMOLOGIST, concerning the odour of *Aspidiotus perniciosus*, and Mr. Cockerell's note on page 36 on the odour of Toumeyella, please allow me to remind these gentlemen and your other readers that I recorded a similar instance in the case of *Gossyparia ulmi* in Insect Life, Volume II., page 39 (August, 1889), on the authority of Mr. J. G. Jack. The wording is as follows: "At this time they secrete a great deal of honey-dew which attracts ants and other insects, and gives off, curiously enough, a pungent odour, which Mr. Jack states is noticeable where large numbers of the coccids are at work, but which we have not noticed at Washington, probably on account of the comparative scarcity of the lice."

L. O. HOWARD, Entomologist.

Mailed April 3rd, 1899.

The Canadian Entomologist.

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OBSERVATIONS UPON SPILOSOMA CONGRUA, WALKER.

BY THE REV. THOMAS W. FYLES, SOUTH QUEBEC.

On the 29th of June, 1897, I found, in the Gomin Swamp, two Spilosomas, females, lying side by side. One of them was much spotted, and presented the exact appearance of the insect which is figured, with closed wings, in the original edition of Dru Drury's work, and named by him *Bombyx cunea*. The other was white, but on the median nerve, at the angle of the second fork, there was a small black dot, hardly perceptible. The thorax was clothed with light down ; the abdomen was white and spotless. The eyes were black, as were also the under sides of the antennæ and feet. The front of the thorax under the head was luteous.

This second moth laid eggs on the 10th of July, and the eggs produced larvæ which, in due time, pupated. The moths appeared in the following spring.

I took the mother moth to the meeting of the Entomological Society of Ontario, at London, and readily identified it with specimens marked "*Spilosoma congrua*, Walker," in the Society's collections.

Of the imagoes raised from this insect some were allowed to escape, some I gave away, and a few were crippled ; but I have twenty-eight of them before me at this moment, and they present a most interesting subject for study. I will group them :—

I. AS REGARDS THE WINGS :

(a) Two males, all but immaculate, having the faintest indication of a dot at the second fork of the median nerve.

(b) One male having a decided black spot at the point above mentioned.

(c) Five males and seven females having the spot and indications of an irregular transverse row of dots near the hind margin.

(d) Seven females with the spot and a well-defined row of black dots near the hind margin.

(e) One male and two females with the spot, and a terminal row and sub-terminal row of dots.

(f) Three males and one female with four rows of dots on the primaries, and a spot near the costa of the secondaries.

II. As Regards the Abdomen :

Eleven specimens are immaculate, and seventeen have longitudinal rows of spots.

(a) and (b) have the abdomen immaculate.

(c) Two specimens have two distinct rows of black spots *on the under side*, and no more ; two have dorsal and side rows of spots, but none underneath. The rest have immaculate abdomens.

(d) One has five rows of spots, and six have the two rows on the under side only ; but of the latter one specimen has two black dots on the back.

(e) One (male) is immaculate as regards the abdomen ; one female has the five rows ; and the other has rows on the under side only.

(f) One (♀) has all five rows ; one (♂) has only the rows on the under side ; and one (♂) has an immaculate abdomen.

Of the males the usual expanse of the wings is 17 lines, but one reaches 20. Of the females the usual expanse is 20 lines.

I sent two of the moths to Washington, and Dr. Dyar kindly wrote me word that the insects belong to the species *Antigone* of Strecker. Mr. Lyman also submitted a pair of the same brood to Mr. Beutenmüller, who said that he had seen Strecker's types at Reading, Pa., a few days before, and that the species was certainly *Antigone*. Very well.

In Smith's list the *S. congrua* of Grote is given as a synonym of *S. antigone* of Strecker. What does Grote say on the subject? "On my first visit to the British Museum I examined Walker's types, and made the following descriptions of his specimens"

Here follows a description that exactly fits my group (c). And he adds, "I was doubtful about its being North American. But very likely it is a form that Mr. Strecker calls *Antigone*, which must join that author's long list of synonyms." (Can. Ent., Vol. XV., p. 9.)

But Walker gives his own account of *S. congrua ;* and, as the British Museum lists are not easily obtainable, and but few of our Canadian entomologists have copies of them, I ask room for the description in full.

"SPILOSOMA CONGRUA.

"Alba; palpi supra nigri; pedes antici nigro luteoque varii. Mas.—caput et thorax anticus subtestacea; alæ anticæ e guttis fuscis quadrisubfasciatæ.

"White. Tarsi with black bands. Fore coxæ and fore femora luteous, with black spots on the inner side; fore tibiæ striped with black on the inner side. *Male.*—Head and fore part of the thorax with a slight testaceous tinge. Fore wings with four oblique very imperfect and irregular bands, composed of pale brown dots. Length of the body 6–7 lines; of the wings 16–20 lines. a—c Georgia. From Mr. Milne's collection."

(List of the specimens of Lepidopterous Insects in the collections of the British Museum. Part III. Lepidoptera Heterocera, p. 669. Published 1855.)

With this description the insects in my group (f) agree. One has even the slightly testaceous thorax, which is not common; and another has the black spots on the inner side of the luteous femora. All have the four bands.

With my specimens before me I can entertain no doubt that Walker and Grote were describing forms of one and the same species. I state this after much consideration, for Smith says, in his "Preliminary Catalogue of the Arctiidæ (CAN. ENT., Vol. XXII., 16), "Walker's description does not apply to *Antigone* at all, while it does apply to *cunea*, a specimen of which, according to Butler, was of the *types*."

What is meant by *cunea?*

There is a moth well known all over North America. It was described and named by Harris (Insects Injurious to Vegetation, pp. 357–9), and much valuable information respecting it has been given by Dr. Bethune (CAN. ENT., Vol. V., p. 141), Professor Saunders (Insects Injurious to Fruits, p. 171), and others. It is the Fall Web-worm Moth, the *Hyphantria textor* of Harris.

Of this *H. textor* we have in Canada but one brood in a season. Its eggs hatch "from July 10th to the middle of August" (John G. Jack, CAN. ENT., XVIII., 23). The larvæ are full-grown by the end of September. The moths have generally, in Canada, spotless wings and spotless abdomens, according to the descriptions given by Harris, Bethune, Saunders, and others, and their usual expanse of wings is 14 lines.

But southward there is a second brood of *textor* which is noted for its variations. The most spotted of these, the extreme variety, is supposed to have been the *Bombyx cunea*, figured by Drury in 1770. And therefore it is said the name of the variety must take the place of the specific name given by Harris, and till very lately generally accepted.

Both Professor Riley and Professor Smith have well and clearly expressed the contention as it now stands. The former says:

"The moths vary greatly, both in size and coloration. They have, in consequence of such variation, received many names, such as *cunea*, Drury; *textor*, Harris; *punctata*, Fitch; *punctatissima*, Smith. But there is no doubt, as proven from frequent breeding of specimens, that all of these names apply to the very same insect, or at most to slight varieties, and that Drury's name, *cunea*, having priority, must be used for the species." (Riley quoted in Packard's *Forest Insects*, pp. 246–7.)

The latter says:

"In Mr. Grote's list of 1882, *textor* and *punctata* stand without number, but in Roman letters, and therefore not as synonyms. There is no doubt at all of the identity of all these forms. Prof. Riley has proved that to demonstration, if proof were required to the statements of earlier writers." (CAN. ENT., XXII., p. 165–6.) And in his *List of Lepidoptera of Boreal America* he gives:

HYPHANTRIA, Harr.

1096. Cunea, Drury.
punctatissima, S. & A.
punctata, Fitch.
congrua, Walker.
textor, Harris.
candida, Walker.
ab. pallida, *Pack.*

But is there really no room for doubt? Is the proof so entirely satisfactory? It might have been were there but one variable insect in the field to meet the requirements, but with two or more the matter is fairly open to question.

Let us consider the illustrations that accompany Prof. Riley's statement. I have them by me in that valuable work, Packard's Forest Insects, p. 245–6. First compare with the illustration of the Fall Webworm Moth on page 245, the illustrations accompanying Dr. Bethune's and Prof. Saunders's articles above referred to — the disproportion in

contour and size at once strikes the eye. Riley's cut represents an insect 20 lines in expanse of wings. I venture to say that no Fall Web-worm Moth ever attained such a size. But latitude was necessary to take in such moths as *congrua* and *cunea*. Then as regards the series of wings given on page 246. These we may conclude, from the whole tenor of the article, include representations of *cunea*, *punctata*, *punctatissima*, etc. They are on the scale of 18 lines for expanse of wings. *There is not one of them but can be exactly matched from insects I raised, or that were taken with the mother insect in the Gomin.*

Let us now consider the larvæ :

A comparison of the Rev. Dr. Hulst's account of the larvæ of *S. congrua* (Ent. Amer., II., 162), and of Professor Saunders's description of the larva of *S. cunea*, in its last stage, with the following life-history, written with care by myself, will, I think, show that the three descriptions relate to one and the same species.

Life-history of *Spilosoma congrua*, Walker :

Eggs.—Waxen, globular, laid dispersedly and unattached on the 10th of July, very small for the size of the insect—one-thirtieth of an inch in diameter. Hatched July 16th.

Newly-hatched larva.—One-tenth of an inch long, of a pale greenish tint, with a row of reddish-brown tubercles along the middle of each segment above. Every tubercle has two or three rather long, black hairs. Head dark brown. The larva feeds with avidity upon *Chenopodium album*, also upon *Taraxacum* and *Plantago*. It shows no disposition to spin. Moulted July 23rd.

Larva after first moult.—Length, three-tenths of an inch. Body reddish-brown, with black warts, from which proceed spreading tufts of long, black hairs with short spinous branches. Head bilobed, black. Feet black. Moulted July 29th.

Larva after second moult.—Length, half an inch. Body dark brown, with dark brown warts thickly set with tufts of black hair. A side line of red warts with a black tuft above and another below each wart. Larva exceedingly active—scuffles about in true Arctian fashion. Moulted August 8th.

Larva after third moult.—Length, one inch and one-tenth. Head shining black, bilobed. Body black, warty, densely clothed with jet black hairs. A side line of red warts as before, but hardly seen under the pile that overlaps it.

Mature larva.—One inch and three-quarters long. Body colour dark madder-brown, dotted with gray, and almost hidden by jet black bristly tufts which spring from jet black warts—these warts are arranged transversely in the middle of each segment. Along the sides is a row, closely two-fold, of chestnut-coloured patches. Head and fore legs glossy black.

Note.—Every larva of the batch was true to this description.

On August 19th, the larva formed a slight web, with hairs from its body intermingled with the meshes. The web was placed between leaves at the bottom of the breeding-cage.

Chrysalis.—First waxen in colour, then chestnut, and then very dark brown; plump, seven-tenths of an inch long, three tenths in diameter, and terminating in two clusters of spines—5 in each cluster. These spines taper regularly and are terminated with small disks.

To allow the moth to escape the breast portion of the chrysalis-case shells off in the form of an apple-pip.

The indications are that the much-spotted Spilosomas (one of which I mentioned at the beginning of my paper, and five of which were taken, in the neighbourhood of Quebec, in the season of 1897) hold the same relationship to *S. congrua* as the much-spotted *textors* do to their type. They answer exactly to the description of *S. cunea* given by Walker in the B. M. list above mentioned. We cannot, however, be absolutely sure on this point till we have bred moths from one of them.

OBITUARY.

By the demise of Dominique Napoleon St. Cyr, Esq., which occurred in Quebec on the 3rd March instant, from congestion of the lungs, at the age of 74 years, natural science has lost a worthy student and education a hearty promoter. He was born at Nicolet, P. Que., and educated at the college there. In 1867 he was admitted a notary public. Previous thereto he had been a model school and academy teacher. He was returned, in the Conservative interest, to the Legislative Assembly, Que., as member for the county of Champlain, at the general elections in 1875 and again in 1878. Going out of politics, he took up his residence in Quebec, and was appointed Curator to the Provincial Government's museum in the Parliament Buildings. Under his practical care and thorough knowledge of science, what appeared to be a heterogeneous conglomeration of specimens of all sorts, assumed shape as a very nicely classified museum. In it is preserved the valuable entomological collection of Abbé Provencher, which is, of itself, well worth a visit to students. As an entomologist and botanist Mr. St. Cyr will be much missed. His successor as Curator of the Provincial Government museum is Leonidas Larue, Esq., an M. D. of Laval University. J. Eveleigh Treffry.

THREE NEW COCCIDÆ.

BY EDW. M. EHRHORN, MOUNTAIN VIEW, CAL.

Nidularia (?) *californica*, n. sp.

♀ covered with wax resting on a thin white secretion. Colour orange-ferruginous, shiny, varying greatly in size and shape. The average specimens are about 3 mm. long, 1½ wide, and 1 mm. high; generally pyriform, but it is difficult to give any special form, as the insect adapts itself to the position on the plant.

After boiling in K. H. O. derm is colourless, mouth-parts, glands and caudal portion remaining brown. There are indications of antennæ, which are very small and very bristly, segmentation not visible. There are four large disklike spiracles on the ventral surface, each disk contains numerous glands. There is a row of thick, blunt spines on each margin, and one on the dorsum. These marginal spines are shaped like a spear-head set in a socket. With these there are several rows of round spinnerets. Rostrum attached to a prominence, which, however, varies with the position the insect adopts.

End of abdomen strongly chitinized, with the margin strongly crenate and plicate, and deeply cleft in the middle as in Lecanium. Numerous round glands scattered near its margin, and several strong spines on margin at intervals. Anal ring with numerous (eight?) stout hairs. On the ventral surface opposite the anal ring there is a round projection with four stout spines. This is inserted in the cleft of the anal lobes.

Hab.—On the roots of Bunch grass, Mountain View, Cal.

Prof. Cockerell has examined specimens, and says that this strange coccid will probably form a new genus.

Dactylopius eriogoni, n. sp.

♀ enclosed in a densely woven white felt sac about 2½ mm. long and 1 mm. broad; also secreting considerable loose cottony matter.

♀ colour light yellow, slightly covered with white powder, about 2 mm. long and 1 mm. broad. Last segment of body with two short white filaments. Legs and antennæ light brown. Young larvæ and eggs light yellow. When boiled in K. H. O. turns brown. Numerous very fine slender spines on dorsum. Antennæ 7-jointed, quite bristly. Sequence of the joints of the antennæ is quite variable. Joint 7 longest, then comes 3, then 1 and 2, but these are sometimes longer than 3. Joint 4 is next, but sometimes joint 6 is longer. Joint 5 is generally shortest. Formula approximately, 7312465.

Legs small and rather slender. Femur, tibia, and tarsus all bearing rather large stout bristles; femur twice as long as tarsus; claw slender. Tarsal digitules long, slender, slightly knobbed. Digitules of claw slightly longer than claw, slender, knobbed.

Anal lobes not conspicuous, bearing a long, rather stout seta, several stout conical spines, hairs and spinnerets. Anal ring medium, with the usual six hairs.

Hab.—On roots of *Eriogonum*, sp. Stevens Creek Canon, near Mountain View, Cal.

Kermes Austini, n. sp.

♀ scale spherical, about 4.5 mm. broad, 4 mm. long, 4 mm. high. (Amongst the material are a number of parasitized specimens, which are much smaller in size.) Dorsum slightly covered with a waxy secretion. Scale not gibbous and segmentation indistinct, indicated by brown dots when seen through a lens. Colour light brown, with several irregular white stripes running parallel with the segments. There is a distinct groove on the caudal portion of the scale, which is distinctly marked with brown. Scale more or less pitted. Pits generally marked dark brown or black. Ventral scale is more or less flat and light brown. Keel not very prominent. When boiled in K. H. O. derm is light brown, with several brown spots and numerous round glands—orifices, which are larger near the margin. A few short spines near the margin. Antennæ very short and stout, indistinctly 6-jointed. Joint 3 longest, 4 and 5 subequal.

Larva (taken from body of ♀).—Colour pink, twice as long as broad. After boiling in potash, colourless. Antennæ and legs yellow. Antennæ 6-jointed. Joint 3 longest, then comes 6 with numerous stout bristles and rounded at tip. Joints 2 and 5 subequal. Joints 1 and 4 about equal. Formula: 36(25)(41). Caudal tubercles large, with very long setæ and three stout spines—one at base of tubercle, one on its inner margin, and one near setæ. On the margin of body each segment has a stout spine. Legs stout. Tarsus not twice as long as tibia. Femur nearly as long as tarsus + tibia. Claw slender and curved.

Hab.—On twigs of *Quercus oblongifolius*, Guejito Mountains, eight miles east of Escondido, San Diego Co., Cal. (F. Austin, coll.)

This species is allied to *Kermes galliformis*, but smaller, with the darker parts of a decided fulvous colour. Prof. Cockerell has examined specimens, and agrees that it appears to be a valid species.

Lecaniodiaspis rufescens, Ckll.

This species was sent to me from Los Angeles, Cal. Found on a new food plant, *Adenostoma fasciculatum*.

FOUR NEW DIASPINE COCCIDÆ.

BY T. D. A. COCKERELL, N. M. AGR. EXP. STA.

Aspidiotus cueroensis, n. sp.— ♀. Scale diam. slightly over 1 millim., circular, slightly convex above and beneath, with the margin somewhat elevated, like an oyster; very pale gray or grayish-white, quite a delicate shade, exuviæ more or less to one side, covered, inconspicuous, but appearing as a dark spot on the inside of the scale. ♀. Shape ordinary; black when dry. No circumgenital glands. Anal orifice elongate oval, moderately large, distant from bases of lobes about 1½ times its length. Only one pair of lobes, these and the area about their base remaining dark brown after boiling; lobes rather large, but short and broad, contiguous at the base, but thence diverging to their rounded apices, whence they slope downwards to the comparatively short outer side, the shape of the lobes being almost as in *A. ostreæformis*. The second and third lobes, somewhat as in *A. coniferarum*, are represented by rounded prominences, which can hardly be said to project above the margin. Some distance below the place of the second lobe is a small round hyaline gland-spot, quite conspicuous; another, less conspicuous, is adjacent to the base of the rudimentary third lobe. Pyriform processes of the interlobular incisions short and inconspicuous; at the first incision the inner process is considerably larger than the outer. No plates, but the usual spines are present, a pair some distance beyond the place of the third lobe being quite large. Margin beyond the lobed area, and even within it, minutely crenulate. Dorsal glands extremely few, circular. In the area which in other species is occupied by the lateral groups of circumgenital glands, are longitudinal brown stripes, very conspicuous, apparently due to chitinous thickening. A less conspicuous transverse stripe occurs in the place ordinarily occupied by the median group of glands.

Hab.—On rough bark of trunks of *Celtis*, Cuero, Texas, June 1, 1898. *(C. H. T. Townsend.)* One specimen was badly infested by a fungus. Allied to *A. coniferarum*, Ckll.

Aspidiotus duplex, Ckll., var. *pæoniæ*, n. var.— ♀. Has only two groups of circumgenital glands (the anterior and posterior lateral groups being united), each of 70 to 76 orifices. First three pairs of lobes conspicuously notched on each side; fourth lobe with one deep notch. At most only two or three minute squames beyond the fourth lobe. About 15 glands in the groups laterad of the mouth.

Hab.—On bark of pæony from Japan, quarantined by Mr. Craw, at San Francisco. The pæony bark, boiled in caustic soda, gives a very fine crimson or madder colour. Also on *Camellia japonica*, in California. (Dept. Agric., Div. Ent., 376[k].) The scales on *Camellia* were lighter than usual.

Diaspis celtidis, n. sp.—♀. Scale dark gray, exactly like the bark on which it rests, fairly convex, first skin visible, brown or ferruginous, placed near the margin. Greatest diameter of scale about 1 millim.

♀. No circumgenital glands, even in a female full of young. Two pairs of brown lobes; median lobes rather large, upright, separated by a fair interval, in which is a pointed squame extending very slightly beyond their tips; second lobes separated from the median by a similar interval; median lobes rounded at the end, deeply and squarely notched on the outer side; second lobes bluntly pointed, deeply notched on the outer side, the portion beyond the notch forming a pointed lobule, the whole lobe resembling somewhat a lower molar tooth of *Sorex*. Beneath each lobe is a pair of small pyriform brown glands; some distance beyond the second lobe is another pair of these glands, forming a brown patch, but without any lobe, and supporting a rather large spine. Dorsal glands few in number. Anal orifice small, a good distance from hind end.

♂. Scale of the usual *Diaspis* form, but short and broad, hardly more than twice as long as wide, dull gray, not in the least carinate; exuvia placed longitudinally at one end, large, not far from half the length of the scale, thick, dark brown, with small transverse ridges, and a light brown margin and central longitudinal ridge Sometimes the whole exuvia is light brown.

Hab.—On *Celtis*, San Antonio, Texas, June 23, 1898. *(C. H. T. Townsend.)* Somewhat allied to *D. baccharidis*, but differs by the formation of the lobes and the absence of circumgenital glands. On the *Celtis*, at San Antonio, Prof. Townsend found also a variety of *Pulvinaria innumerabilis* (Rathv.).

Diaspis auranticolor, n. sp.—♀. Scale circular or suboval, diam. not much over 1 millim., only slightly convex, white, but covered with a gray film of the epidermis of the plant. Exuviæ lateral, bright lemon-yellow, first skin exposed. Removed from the bark, the scales leave a white mark.

♀. Bright orange; light yellowish after loss of contents, the orange colour being contained in oil-like globules, not altered by caustic alkali,

Five groups of circumgenital glands, median of 9, anterior laterals 26, posterior laterals 16 to 19; two rows of dorsal transverse glands on pygidial area. Anal orifice level with hind part of anterior lateral groups of glands. Lobes not at all brown; median lobes large, pyramidal, blunt at end, their bases meeting but their tips far apart, the outer side crenate with two small notches, a small spine at each inner base. Second lobes represented by three rounded but rather elongate lobules, of which the middle one is considerably the largest; third lobes represented by two pointed processes, the second of which may be bifid at its end; fourth and fifth lobes represented by three or four pointed processes, like the teeth of a saw. Squames quite long, spinelike, with simple ends; one between the first and second lobes, two between the second and third, three between the third and rudimentary fourth, six between the rudimentary fourth and fifth, and about five large ones beyond the fifth.

♂. Scale of the usual form, white, without any keel; exuvia light yellow. Newly-hatched larvæ (alive) pale pink, without marks. (The larva of *D. amygdali* is pale yellowish.)

Hab.—On *Osmanthus illicifolia* (this is presumably a garden name for *O. aquifolium*, Siebold) from Japan, quarantined Feb. 3, 1899, by Mr. A. Craw, at San Francisco. Related to *D. amygdali*, but quite distinct.

A FEW CANADIAN LONGICORNS.

BY W. HAGUE HARRINGTON, F. R. S. C., OTTAWA.

Having prepared for the Ottawa Naturalist a list of the Cerambycidæ occurring in this district, I find, among other Canadian material in my cabinets, the following species which appear worthy of record: For the Vancouver Island species I am chiefly indebted to my friend, Rev. G. W. Taylor, who resided near Victoria when the specimens were collected. Other material was collected by Mr. A. J. Hill, of New Westminster, B. C., and by Dr. Fletcher. Several of the species I captured when at New Westminster, etc., in 1888, and a few were received from Mr. T. C. Weston, of the Geological Survey, and from the late Capt. G. Geddes.

Ergates spiculatus, Lec. Two fine specimens from V. I.

Prionus californicus, Mots. Apparently common in V. I.

Tragosoma Harrisii, Lec. Cypress Hills, M.

Asemum atrum, Esch. Common, B. C. and V. I.

Nothorhina aspera, Lec. Several from V. I.
Criocephalus productus, Lec. B. C. (Mr. A. J. Hill, New Westminster.)
Criocephalus agrestis, Kirby. Stupart's Bay.
Criocephalus asperatus, Lec. Cypress Hills and B. C.
Phymatodes variabilis, Fab. Common, V. I.
Phymatodes nitidus, Lec. V. I. (Victoria.)
Phymatodes decussatus, Lec. Common, V. I., B. C.
Rosalia funebris, Mots. B. C. (New Westminster, Riverside, etc.)
Clytus planifrons, Lec. V. I. (One specimen.)
Neoclytus conjunctus, Lec. V. I. (Two specimens.)
Leptalia macilenta, Mann. B. C.
Toxotus vestitus, Hald. Very common in B. C. and V. I. The form with red legs and antennæ not rare.
Toxotus virgatus, Lec. Crane Lake, N.-W. T. (Prof. Macoun.)
Pachyta monticola, Rand. B. C. Very variable in colour.
Pachyta liturata, Kirby. Fort McLeod, Alta., and B. C.
Pachyta spurca, Lec. V. I. Very fine specimens.
Achmæops longicornis, Kirby. Fort McLeod. (Geddes.)
Leptura obliterata, Hald. V. I.
Leptura subargenta, Kirby. B. C. Very common.
Leptura læta, Lec. V. I. A fine species.
Leptura Canadensis, Fab. B. C.
var. *erythroptera*, Kirby. B. C.
var. *cribripennis*, Lec. B. C.
Leptura vagans, Oliv. Muskoka, O.
Leptura lætifica, Lec. B. C. and V. I. Very common.
Leptura chrysocoma, Kirby. B. C. and V. I.
Leptura proxima, Say. B. C.
Leptura crassicornis, Lec. V. I.
Leptura scripta, Lec. B. C. and V. I. Very common.
Plectrura spinicauda, Mann. V. I. (Fletcher.)
Monohammus maculosus, Hald. Rat Portage, O. (Fletcher.)
Monohammus confusor, Kirby. Sydney, N. S., to Westminster, B. C.
Monohammus marmorator, Kirby. Cypress Hill. (Weston.)
Synaphœta Guexi, Lec. V. I. (Taylor.)
Acanthocinus spectabilis, Lec. B. C. (Hill.)
Oberea quadricallosa, Lec. B. C.
Tetraopes femoratus, Lec. B. C. Common.

CONTRIBUTIONS TO THE KNOWLEDGE OF MASSACHUSETTS COCCIDÆ.—I.

BY GEO. B. KING, LAWRENCE, MASS.

The published records of the occurrence of coccids in Massachusetts are so scattered and the number found to exist is so large, that it seems quite desirable that they should be brought together and published in one entomological journal. So far as I can learn from careful search of the literature up to January, 1896, there had been only 13 species recorded. Since then the list has increased to 74. A list of the 13 species is: *Aspidiotus perniciosus*, *Mytilaspsis pomorum*, *Chionapsis furfurus*, *C. spartinæ*, *Aulacaspis bromeliæ*, *Dactylopius adonidum*, *Phenacoccus aceris*, *Gossyparia ulmi*, *Orthezia insignis*, *Pulvinaria innumerabilis*, *Lecanium hesperidum*, *L. platycerii*, and *L. filicum*. A check-list reference-list of the literature of Massachusetts Coccidæ will be published in a supplementary article. Distribution, food plants, parasites, and predaceous enemies (known to me to occur in Massachusetts on coccids) will be given; also, the distribution of the Massachusetts coccids found in other States. This will show to some extent what little is generally known of these most destructive insects in this country. The only States that know, or have any material knowledge of, the number of these pests that occur within their borders are Colorado, California, Florida, New York, New Mexico, and Massachusetts; Washington, D. C., should also be added; New Mexico and Massachusetts leading, the former having 73 and the latter 74 species. I. means introduced species; N., native species. The year placed after the author's name is the year in which the insect was described, and the other is the year when it was first known to occur in the State. The foreign distribution will only be given when found necessary.

COCCIDÆ.

Monophlebinæ.

(1) *Icerya Purchasi*, Mask; 1878–1879. I.

This species was discovered by Dr. Hagen in a greenhouse at Cambridge, Mass., and this is the only instance that I know of its being found in this State. It is quite common in California.

Coccinæ.

(2) *Eriococcus quercus*, Comst; 1881–1898. N. Syn. Rhizococcus quercus, Comst.

I found this coccid last year at Andover and Lawrence, Mass., on young white oak and Vaccinium corymbosum. It is found in Florida and Georgia on Laurel oak (Quercus laurifolia) and Q. aquatica, Gallberry and Grass. I have reared a Chiloneurus sp. from this coccid.

(3) *Eriococcus azaleæ*, Comst.; 1881–1898. N.

Found at Methuen, Mass., on Cratægus coccinea. It has been taken at New York and Michigan on wild and cultivated Azalea; also at Washington, D. C., in the department greenhouses on Azalea.

(4) *Gossyparia ulmi*, Geoff.; 1764–1887. I.

A very common pest. Found at Amherst, Boston, Brookline, Brighton, Concord, Springfield, Methuen, Andover, and Lawrence, Mass., on native white elm, Scotch elm, and Camperdown elm; also found at Washington, D. C.; New Jersey, Maryland, New York, Michigan, Western Nevada, and California, on Ulmus americana, U. racemosa, U. campestris, U. montana, and U. fulva. It is parasitized by Coccophagus gossypariæ, How., and has been reared by Mr. Cooley, at Amherst, Mass., 1898.

(5) *Ripersia lasii*, Ckll.; 1896–1894. N.

Very often found at Lawrence, Methuen, Andover, North Andover, Dracot, and Haverhill, Mass., in nests of Lasius americanus, Gm., and Lasius flavus. L.; also found feeding on the roots of China asters at Lawrence; here also attended by Lasius americanus. All of the genus Ripersia found in Massachusetts are subterranean species and attended by ants. No males of the genus have been found by me. It is presumed that they are viviparous. Mr. R. J. Crew in 1897 found this coccid at Toronto, Canada, in nest of Lasius americanus, Gm.

(6) *Ripersia Kingii*, Ckll.; 1896–1894. N.

It is abundant in ant-nests at Lawrence, Dracot, Methuen, and Springfield, Mass., found at the latter place by Dr. George Dimmock in 1898. Generally found in nests of Lasius flavus, L., and Lasius claviger, Rog.

(7) *Ripersia flaveola*, Ckll.; 1896–1895. N.

A very common species found at Lawrence, Methuen, Dracot, and Haverhill, Mass., in nests of Lasius claviger, Rog.

(8) *Ripersia Blanchardi*, King and Ckll.; 1897–1897. N.

Large and not often met with ; found at Haverhill, Mass., in nest of Lasius claviger, Rog.

(9) *Ripersia minima*, Tinsley and King ; 1899–1898. N.

This is the smallest of the Dactylopinæ known ; found at Lawrence, Mass., in nests of Lasius americanus, Gm.

(10) *Dactylopius citri*, Risso. ; 1813–1879. I. Syn. Dactylopius phyllococcus, Ashm.; Lecanium phyllococcus, Ashm.; Dactylopius destructor, Comst.; farinosus, Deg. (?) ; and brevispinus, Targ.

A first-class pest in all greenhouses at Lawrence, and no doubt in all the greenhouses in this State ; very common on Coleus plants, Cacti, Geranium, Ivy-Hedera, and also found in ants' nests. It is recorded from Washington, D. C.; New Mexico, California, Florida, Colorado, and Minnesota, on Habrothamnus, Solanum jasminoides, Orange, Croton, Arabian and Liberian Coffee-plants.

(11) *Dactylopius adonidum*, L.; 1769–1828. I. Syn. longispinus, Targ.; Coffeæ, Ledern ; Longifilis, Comst.

This is another very common pest at Lawrence, Mass., in all greenhouses on palms and Coleus ; it is found in ants' nests at Lawrence ; at Washington, D. C., and New Mexico on a house fern. It is quite safe to say that the two last coccids cited can be found in nearly all of the greenhouses in Mass., although we have no such record, and perhaps in nearly every State if looked for.

(12) *Dactylopius sorghiellus*, Forbes ; 1885–1896. N. Syn. Dactylopius Kingii, Ckll. (variety).

Frequently found in nests of Lasius claviger, Rog.; L. flavus, and L. americanus, Gm., at Methuen, Lawrence, and Haverhill, Mass., on corn roots, leaf sheath and leaf sorghus, on roots of June and timothy grass, and attended by ants.

(13) *Dactylopius sorghiellus*, var., Kingii, Ckll.; –1896. N.

Found with the same ants and in the same locality.

(14) *Dactylopius claviger*, King and Tinsley ; 1897–1896. N.

This species is found at Andover and Methuen, Mass., in nests of Lasius claviger, Rog.

(15) *Dactylopius Cockerelli*, King and Tinsley; 1898–1896. N.

A very common species; found at Lawrence, Methuen, Andover, and Dracot, Mass., in nests of Lasius flavus, L.; L. claviger, Rog.; and L. Americanus, Gm. The above three species are subterranean and their food plants are as yet unknown.

(16) *Dactylopius pseudonipæ*, Ckll.; 1897–1898. N.

This species seems to be quite common at Lawrence in greenhouses on various species of palms, and is also found in Michigan and California on palms in greenhouses.

(17) *Phenacoccus aceris*, Sign.; 1875–1894. I. Syn. Pseudococcus aceris, Sign.

A very injurious species to Maples at Springfield, Jamaica Plains, Brookline, Norwood, and Holyoke, Mass. It is recorded from Rhode Island, Pennsylvania, New Jersey, Maryland, and Illinois, and is preyed upon by a coccinellid (Hyperaspis signata, Oliv.), observed by R. A. Cooley at Springfield, Mass., 1898.

(18) *Phenacoccus americanæ*, King and Ckll.; 1897–1897. N.

This has only been found once in a nest with Lasius americanus, Gm., at Andover, Mass.

(19) *Sphærococcus sylvestris*, Ckll. and King; 1898–1898. N.

Found on a young white oak at Methuen, Mass. This is the first species of the genus to be found in North America. The type is in the national collection of Coccidæ at Washington. The genus is known from Australia to Japan.

Asterolecaniinæ.

(20) *Asterolecanium quercicola*, Bouche; 1851–1898. I. Syn. Asterodiaspis quercicola, Bouche.

A common species at Middlesex Fells, on white oak and swamp oak, at Medford on English oak, and Worcester on golden oak. Mr. A. H. Kirkland in 1898 reared several examples of a very interesting imported parasite, Habrolepis Dalmannii, from the Coccidæ at Middlesex Fells. All the parasites mentioned in this paper have been studied by Dr. Howard. The coccid has been found at Washington, D. C.; New York, and Connecticut, on imported European oaks and American white elm.

THE STENOPELMATINÆ OF THE PACIFIC COAST.

BY SAMUEL H. SCUDDER, CAMBRIDGE, MASS.

A greater variety of generic types will be found among the Stenopelmatinæ of the Pacific Coast of the United States than in any other district of equivalent area in our country. I have therefore thought it well to make a list of them in connection with the description of a few new forms from that region. We owe our knowledge of the Orthoptera of that district mainly to the collections of Messrs. Henry Edwards, Behrens, Crotch, and latterly Morse.

STENOPELMATINI.

In my Guide to the . . . N. A. Orthoptera (1897) I carelessly overlooked the genus Cyphoderris Uhler, which belongs to the Stenopelmatini, but to a different group of genera from that to which Stenopelmatus belongs. The two groups may be distinguished by the following characters :

Fastigium of vertex confused with the front of the head, not produced between the antennæ ; pronotum broader in front than behind, the front margin sinuate, with an intramarginal sulcus ; fore coxæ unarmed ; fore tibiæ with no foramina..... *Stenopelmati.*

Fastigium of vertex separate from the front, produced more or less between the antennæ ; pronotum not broader in front than behind, the front margin straight or convex, with no intramarginal sulcus ; fore coxæ armed with a spine ; fore tibiæ furnished with foramina on both faces or at least on the inner face..... *Anostostomata.*

Stenopelmati.

Represented in the United States only by the genus Stenopelmatus, nearly all the species occurring in our country being found on, and most of them confined to, the Pacific Coast.

Stenopelmatus Burm.

Four species of this genus were credited to the United States, and all to the Pacific Coast, in Brunner's monograph of the Stenopelmatinæ (1888), and he did not recognize the species described by Haldeman in 1852 as fuscus, by Thomas in 1872 as fasciatus, or by Scudder in 1876 as oculatus, all from the region to the east of the Sierra Nevadas. The first of these it is impossible to determine, but types of the other two are before me. The species found in the United States and Canada may be separated by the following table :

a^1. Hind tibiæ armed with five spines* on inner margin above.

b^1. Head relatively small; hind tibiæ relatively long, being about or nearly twice as long as the pronotum on the mediodorsal line; the upper inner spurs of same much longer than the metatarsus *longispina.*

b^2. Head distinctly broader than pronotum; hind tibiæ relatively short, being hardly or not more than half as long again as the pronotum on the mediodorsal line.

c^1. The apical spine on the inner margin of the hind tibiæ markedly smaller than the preceding.

d^1. Hind tibiæ subrotundate above, the fourth spine of inner margin (counting from base) more widely separated from the third than the others from their neighbours, those of the outer margin two, rarely three, in number, the upper inner spur as long as the metatarsus *irregularis.*

d^2. Hind tibiæ sulcate or subsulcate above, the spines of the inner margin equidistant, those of the outer margin four in number, the upper inner spur much shorter than the metatarsus. *californicus.*

c^2. The apical spine on the inner margin of the hind tibiæ but little or not smaller than the preceding.

d^1. Outer margin with 5–6 spines..... *fasciatus.*

d^2. Outer margin with 2–4 spines..... *oculatus.*

a^2. Hind tibiæ with less than five spines on inner margin above; head not broader than pronotum.

b^1. Hind tibiæ with four equal spines on inner margin above, three on outer margin; head and pronotum nearly uniform castaneous, unpictured *histrio.*

b^2. Hind tibiæ with three spines on inner margin above, two on outer margin; head and pronotum castaneous, heavily pictured (on the head longitudinally) with dark fuscous..... *pictus.*

1. *Stenopelmatus longispina* Brunn.—A well marked species, readily recognized by its long hind tibiæ; the inner calcaria of the same are also exceptionally long, but in this it agrees with the next species. It was originally described from Vancouver Island. I have seen specimens from Fort Boise, Or., Suckley; Drain, Sept. 11, and Roseburg, Douglas

*Occasionally, by anomaly, there are but four spines on one or both legs. See below, under *S. oculatus.*

Co., Or., Sept. 10, A. P. Morse; California, Uhler, Dyar, Edwards; Coast of California, Trowbridge; and San Diego, Cala, Palmer.

2. *Stenopelmatus irregularis* Brunn.— This was described from Mazatlan, Mex., Arizona and California. I have specimens from near Lake Tahoe, Nevada, Sept., Henshaw; California, Edwards, Behrens, Dyar; San Francisco, Cal., Edwards, Bischoff; Sonoma and Marin Counties, Cal., Osten Sacken; San Bernardino, Cal., Feb., Palmer, and Ft. Tejon, Cal., Uhler.

3. *Stenopelmatus californicus* Brunn.— Originally described from Vancouver only, and notwithstanding its name, now first recorded from California. I have before me specimens from Drain, Sept. 11, and Roseburg, Douglas Co., Or., Sept. 10, A. P. Morse; Ft. Crook, Cal.; Mill Valley, Cal., Aug. 22, Morse; Nevada Valley to Cloud's Rest, Yosemite Valley, Cal., Aug. 12, Morse; 8-mile station, road to Yosemite Valley, Cal., Aug. 9, Morse; Tehachipi, Kern Co., Cal., Aug. 2, Morse; South Santa Monica, Los Angeles Co., Cal., Rivers (Morse); and San Diego, Cal., July.

Stenopelmatus fasciatus Thom.— I have seen only the single existing type, a female, in the U. S. National Museum, which comes from southern Idaho. It does not agree with Thomas's description in the spines of the hind tibiæ, as it has five on the inner carina and five or six (differing on the two legs) on the outer carina; while he gives five on the inner and four (♂) or three (♀) on the outer carina. It is therefore doubtful whether all his specimens belonged to one species; if they did not, the others probably belonged to the next species, as it is the only other one known from east of the Sierra Nevadas, except in the south. Thomas credits the present species to Wyoming and Utah as well as Idaho.

I introduce the species here to complete the reckoning of the forms found in the United States and Canada, but prefix no number, as it is not known from the Pacific Coast.

4. *Stenopelmatus oculatus* Scudd. (*S. hydrocephalus* Brunn.) — The specimens I have seen come from Harrison, Sioux Co., Neb., Bruner; Wyoming, U. S. Nat. Mus.; Utah, Suckley, Packard; Spring Lake Villa, Utah Co., Utah, Aug. 1–4, Palmer; St. George, Washington Co., Utah, Apr. 1–12, Palmer; Mt. Trumbull, Utah, June 7–10, Palmer; Mokiak Pass, Utah. Apr. 20–30, Palmer; Nevada, Akhurst, Edwards; Virginia City, Nev., Seckels; Carson Valley, Nev., Simpson; Ruby

Valley, Nev., Ridgway ; western Washington, U. S. Nat. Mus.; California, Edwards ; El Dorado Co., Cal., 4,000 feet, Gissler ; Sonoma and Marin Counties, Cal., Osten Sacken ; San Francisco, Cal., Edwards ; between San Luis Obispo and San Simeon Bay, Cal., Palmer ; Ft. Tejon, Cal., Uhler ; San Bernardino, Cal., Palmer; Ehrenberg, Colorado River, Ariz., Palmer ; Fort Buchanan, Southern Arizona, Palmer ; Cantonment Burgoyne, mountains of New Mexico ; Las Cruces, N. Mexico, Cockerell ; Eagle Creek, White Mts., Lincoln Co., N. Mex., 7,000 feet, Wooton (Morse). This is our most widespread species.

It is possibly not distinct from the preceding, in which case the name *fasciatus* has precedence. It is somewhat more variable than the other species in the number of spines on the hind tibiæ, and there are even occasionally only four on the inner margin. The single specimen from Ft. Tejon, quoted above, has the inner upper calcaria of the hind tibiæ distinctly longer than the metatarsus ; it is a large male, measuring 39 mm. in length.

5. *Stenopelmatus histrio* Sauss.—This Mexican species extends into our territory. Specimens before me come from California, Edwards ; San Francisco, Cal., Edwards, Bischoff; Sonoma and Marin Counties, Cal., Osten Sacken ; Pacific RR. explorations along Lat. 38°, Beckwith ; and Mexico, Sumichrast.

6. *Stenopelmatus pictus*, sp. nov.—Castaneous, heavily infuscated over the whole upper surface of the body. Head not broader than the pronotum, longitudinally broadly striped with dark fuscous over the vertex, hardly encroaching on the smooth genæ, nor quite reaching the back of the head ; front feebly and sparsely punctate ; eyes but little prominent, briefly subpyriform. Pronotum subquadrate, the front portion but little broader than the rest, the hinder angles broadly rounded, the disk, excepting before the submarginal sulcus, almost entirely dark fuscous, sometimes threaded with rufo-castaneous. Hind femora short and broad ; hind tibiæ broad and subequal on a side view, the outer face subrotundate, the upper plane, furnished above on the inner carina with three not very large, equidistant and subequal but distally enlarging spines, on the outer carina with two similar ones ; inner calcaria not very stout, even slender in the male, increasing a little in length from below upwards, the upper as long as (♂) or nearly as long as (♀) the metatarsus. Dorsal plates of abdomen dark fuscous, edged posteriorly with rufo-castaneous.

Length of body, ♂ 16.5 mm., ♀ 25 mm.; pronotum, ♂ 5 mm., ♀ 5.75 mm.; hind femora, ♂ 8 mm., ♀ 9 mm.; hind tibiæ, ♂ 8 mm., ♀ 9 mm.

1 ♂, 3 ♀.—California; San Francisco, Cal., Edwards.

This species differs from the Mexican *S. vicinus*, to which it appears to be most nearly allied, in its dorsal colouring, smooth genæ, stout and non-sulcate hind femora, the fewer spines on the outer carina of the hind tibiæ, and its longer, inequal calcaria.

Anostostomata.

To this group the United States can furnish but a single genus.

Cyphoderris Uhl.

As stated above, this genus was accidentally omitted from my Guide to the . . . N. A. Orthoptera, but its position therein is here indicated.* It falls in the vicinity of Pherterus Brunn., found in the Antilles and Brazil. It is the only one of our Stenopelmatinæ which is not apterous.

7. *Cyphoderris monstrosa* Uhl.—Oregon. I have seen only Uhler's types. Thomas records it from Wind River, Wyoming.

Rhaphidophorini.

Represented in the United States and on the Pacific Coast by two groups, Tropidischiæ and Ceuthophili.

Tropidischiæ.

The sole representative of this group occurs only on the Pacific Coast.

Tropidischia Scudd.

A remarkable long-legged form, the hind tibiæ quadrangulate, with spines on each margin, and represented by a single species.

8. *Tropidischia xanthostoma* Scudd.—Crescent City, Del Norte Co., Cal., Agassiz; Mendocino, Cal., Behrens; Philomath, Benton Co., Oregon, Sept. 15, A. P. Morse.

Ceuthophili.

This group contains the bulk of the Pacific Coast, and indeed of North American, Stenopelmatinæ; most of them will be found in my paper on the North American Ceuthophili (Proc. Amer. Acad. Arts Sc.,

*It is well to state here that I also overlooked Uhler's genus Camptonotus, described in the same paper with Cyphoderris. It is identical with Brunner's genus Neortus, and has priority.

XXX.. 17–113, 1894). One new genus has been established by Sausure and Pictet since its publication, but it may perhaps not be distinct from Ceuthophilus. Hadenœcus Scudd., and Daihinia Hald., are the only North American genera not known to occur on the Pacific Coast.

Ceuthophilus Scudd.

Undoubtedly many species of this genus remain to be discovered on the Pacific Coast. The following include all known to me up to the present time :

9. *Ceuthophilus celatus* Scudd.—Originally described from Siskiyou Co., Shasta Co., San Francisco, and Los Angeles Co., Cal. Mr. Morse brought specimens from Victoria, B. C., Sept. 29, and Divide, Lane Co., Oregon, Sept. 12.

10. *Ceuthophilus agassizii* Scudd.— Recorded from islands in the Gulf of Georgia, between Vancouver and Washington ; Vancouver Island, British Columbia, and Oregon.

11. *Ceuthophilus polluticornis*, sp. nov.—Allied to *C. mexicanus* and *C. pallescens*, but much darker than they, castaneous or testaceous, heavily and irregularly mottled with fuscous ; hind femora testaceous, dotted with luteous and more or less clouded with fuscous, with a large and conspicuous dark fuscous patch on the lower half of the outer face, at least in the male, the lower margin luteous basally. Antennæ very slender, about or nearly three times as long as the body, luteous or testaceous except basally, where for a distance about equal to the breadth of the body, excepting generally in the female, they are dark rufo-fuscous. The legs are not very slender. Fore femora no stouter than middle femora, about a fifth longer than the pronotum and less than half as long as the hind femora, the inner carina with only a short subapical spine. Middle femora with only a single short spine on either inferior carina, besides the longer subapical spine of the front and the genicular spine of the hind carina. Hind femora not so long as the body and more than twice as long as the fore femora, rather stout and with hardly any equal distal portion, about three (♂) or three and a half (♀) times as long as broad, with but few scattered raised points along the upper surface in the male, the outer inferior carina serrulate, with a rather large preapical spine (♂) or unarmed, with a broad tooth or angulation in place of the spine (♀), the inner spinulose with a similar spine more distant from the tip (♂) or with three or four subapical spinules (♀). Hind tibiæ straight, slightly longer than the femora, armed beneath with a pair of

subapical as well as apical spines; spurs subopposite, the basal pair a little before the middle of the tibiæ, scarcely longer than the tibial depth, set at an angle of about 40° with the tibiæ, and about 100° with those of the opposite side; inner middle calcaria as long as the metatarsus, twice as long as their mates. Hind tarsi about two-fifths as long as the tibiæ, the first joint as long as the rest together, the second twice as long as the third. Cerci tapering regularly, not more than half as long as hind femoral breadth. Ovipositor about four-fifths as long as the hind femora, nearly straight and slender, but apically upcurved and finely pointed, the inner valves very bluntly and feebly crenulate.

Length of body, ♂ 13 mm., ♀ 12 mm.; pronotum, ♂ 3.75 mm., ♀ 4 mm.; fore femora, ♂ 4.4 mm., ♀ 4.75 mm.; hind femora, ♂ 10 mm., ♀ 10.5 mm.; hind tibiæ, ♂ 10.5 mm., ♀ 11.25 mm.; ovipositor, 8 mm.

2 ♂, 5 ♀.—Eight-mile Station, about 5,500 feet, on the road from Wawona to the Yosemite Valley, Cal., A. P. Morse.

This species is easily recognized, at least in the male sex, by the antennæ discoloured at base and the dark patch on the hind femora.

12. *Ceuthophilus vinculatus* Scudd.— There are specimens in the National Museum from California and Washington, and the Cambridge Museum has a pair, apparently belonging here, from Santa Barbara, Cal.; the species is also found in Nevada, Iowa, and Nebrask.

13. *Ceuthophilus testaceus* Scudd.—A single specimen, apparently of this species, was taken at Los Angeles, Cal., July 29, by A. P. Morse. It had previously been known only from Missouri, Nebraska, and Wyoming.

14. *Ceuthophilus californianus* Scudd.—This has been reported from Vancouver Island, and from many places in California, in Contra Costa, Sonoma, Marin, San Francisco, Alameda, San Mateo, Santa Clara, Santa Barbara, Los Angeles and San Bernadino Counties, as well as from Utah and Arizona. Mr. Morse brought home a specimen from Corvallis, Benton Co., Oregon, taken April 19. (See below, under *Hemiudeopsylla californiana*).

15. *Ceuthophilus pacificus* Thom.—This has been taken by many persons in California without closer specification of locality, and by others in Contra Costa and Los Angeles Counties, and at Lake Tahoe. It also occurs in Nevada.

16. *Ceuthophilus salebrosus*, sp. nov. — Dark luteous, profusely clouded and more or less spotted with dark fuscous. Antennæ slender, fully half as long again as the body, castaneous or rufo-castaneous at base, luteous beyond, about every tenth joint pallid. Legs rather short. Fore femora not stouter than the middle femora, about a third longer than the pronotum and a little less than half as long as the hind femora, the inner inferior carina with a short subapical spine. Middle femora with a single small subapical spine on each inferior carina, besides a genicular spine behind. Hind femora considerably shorter than the body, a little more than twice as long as the fore femora, not very stout, a little less (♂) or a little more (♀) than three times as long as broad, the apical fifth (♀) or sixth (♂) equal, in the male heavily scabrous with minute raised points in oblique rows and especially along the upper margin, the outer inferior carina with an oblique preapical prominent denticle, immediately preceded by obscure serrulation (♂) or obscurely serrulate in distal half (♀), the inner carina distantly, very delicately and minutely spinulose (♀) or with an oblique prominent compressed denticle in the middle of the distal half, preceded by serrulations which almost mount the proximal face of the denticle (♂). Hind tibiæ strongly and sharply bowed just before the middle and so shorter than the hind femora, a little expanded before the bend (♂) or straight, simple, and slightly longer than the femora (♀), armed beneath with a pair of apical and a pair of subapical spines; spurs opposite or subopposite, the basal pair somewhat before the middle of the tibia, about as long as the tibial depth and divaricating but little. Hind tarsi nearly half as long as the tibiæ, the first joint as long as the rest together, the second nearly three times as long as the third and about as long as the fourth. Cerci of female stout in the basal half, beyond tapering, at least two-thirds as long as the hind femoral breadth. Ovipositor nearly straight, gently tapering in the basal half, beyond equal for a brief space, and then tapering more rapidly to a fine point and upcurved, less than two-thirds as long as the hind femora, the inner valves serrulate, with no apical hook.

Length of body, ♂ 10 mm., ♀ 12 mm.; pronotum, ♂ 3 mm., ♀ 3.25 mm.; fore femora, ♂ ♀ 4 mm.; hind femora, ♂ 8.25 mm., ♀ 8.5 mm.; hind tibiæ, ♂ 7.25 mm., ♀ 9 mm.; ovipositor, 5 mm.

1 ♂, 1 ♀.—Tenino, Thurston Co., Washington, Sept. 24, A. P. Morse.

The dorsal surface of the abdomen of the male, as in *C. pacificus* and *C. henshawi*, to which this species is closely related, is not smooth as in other species of Ceuthophilus, and like them also the fastigium of the vertex is developed as a triangular prominence pushed between the antennal scrobes. In the present species the roughnesses of the abdomen are found from the third segment backward and consist of transverse series of slightly elongated tubercles on the posterior margin of the segments.

17. *Ceuthophilus henshawi* Scudd.— It has been reported from Vancouver Island, Washington, Oregon, and from Placer, Marin, Kern, and Los Angeles Counties in California. It was taken at Tenino, Wash., Sept. 24, by A. P. Morse.

Hemiudeopsylla Sauss.–Pict.

This genus was founded primarily on a Mexican species, to which three others, one from Mexico and two from central California were added. I have been unable to identify the Californian species with anything I have seen, but add them to the list.

18. *Hemiudeopsylla platyceps* Sauss.–Pict.—Marin, Co., California.

19. *Hemiudeopsylla californiana* Sauss.–Pict.—Marin Co., California. This was supposed by the authors to be my *Ceuthophilus californianus* (see above), but their description does not agree with my types, and the specific name must be changed to a new one unless it belongs with some previously described species, which I think improbable.

Phrixocnemis Scudd.

20. *Phrixocnemis validus* Scudd.—California, H. Edwards. Known hitherto by a single specimen only.

Eudeopsylla Scudd.

21. *Eudeopsylla nigra* Scudd.—A single specimen has been taken in El Dorado Co., Cal., 4,000 feet, by Gissler ; otherwise it is known only from the region between the Mississippi Valley and the Rocky Mts., in Manitoba, Minnesota, Dakota, Illinois, Iowa, Nebraska, Kansas, Missouri and Colorado, though one specimen has been brought from Arizona.

Gammarotettix Brunn.

22. *Gammarotettix bilobatus* Thom., sp.—This is known only from central and southern California, having been taken in Lake, Sonoma, Marin, San Mateo, Santa Clara, Los Angeles and San Diego Counties.

CHRYSOPHANUS THOE OF GRAY — WHY IS IT NOT C. HYLLUS, CRAMER?

BY A. G. BUTLER, PH. D., BRITISH MUSEUM, LONDON, ENGLAND.

In my Catalogue of Fabrician Diurnal Lepidoptera, p. 173, I (in 1869) unhesitatingly identified examples of a *Chrysophanus* in the British Museum collection with Cramer's *Papilio hyllus*, and at the present time I do not see the slightest valid reason for altering that decision.

In his "Butterflies of the Eastern United States," Dr. Scudder, at the end of his synonymy of *Chrysophanus thoe*, says, "Not Papilio hyllus, Cram."; but, in his account of the species, I find no reason adduced for this assumption, though I can readily believe that the incorrect locality, "Smyrna," given by Cramer, and the somewhat careless drawing of the spots across the disk of primaries, may have influenced him.

That *C. hyllus* is not a European type, in the Staudingerian sense of the term, may be concluded from the fact that it is excluded from Staudinger's Catalogue, and I think I may safely affirm that there is no European species which at all nearly approaches it. On the other hand, anyone acquainted with the utter unreliability of many of Cramer's localities for his species, and with the unequal merit of his drawings, would have no hesitation in at once pronouncing his figures of *P. hyllus* to be a representation of the female of *C. thoe*.

If *C. hyllus* and *C. thoe* are not one and the same species, what is Cramer's insect? Ruhl, in his "Palœarktischen Gross-schmetterlinge," 1892, ignores it entirely; indeed, by general consent, the students of European and allied butterflies are decided as to its having nothing to do with the fauna of Asia Minor or Europe.

If, therefore, *C. hyllus* is not *C. thoe*, it must be an extinct species closely related to the latter, for there is nothing else in the least approaching it. If this conclusion commends itself to American Lepidopterists, well and good, but they must not mind being classed with those who consider it "folly to be wise."

CABINET PEST DETERRENT.

One of the most worrying things an entomologist has to put up with is that after carefully making a collection his most valued specimens are nearly eaten away, either with mites or the Dermestes beetle.

For the benefit of my brother enthusiasts, let me give briefly my personal experience. Last June captures at light were very good and numerous. Many rare insects were taken and set out. The setting-boards were placed on a shelf. By the morning the contents of three boards were literally eaten away by large black ants, house flies, and the little black and orange beetle. If my thoughts had been candidly expressed I am afraid my reputation would have been irretrievably lost, so I hunted around for a remedy and was soon successful in finding one.

The ingredients are —

Corrosive Sublimate, 2 dr.;
Turpentine, ½ oz.;
Rectified Spirits of Wine, 3½ ozs.

These are simply mixed together.

Directions.—First shake the bottle briskly. Take a small camel's-hair brush and apply a thin streak of this preparation under the body of each insect, taking care not to touch the wings. (Better try the effect on some common moths first.)

Now comes the test of ten months. The preparation was applied to several Cecropias, while others were placed beside these without being so treated. These were all laid on a shelf. Next morning the bodies of the unprepared moths were mere shells. Ants and beetles were having no end of a feast. Not so with the others. They are there yet and not a sign of a mite, beetle or ant to be seen.

As regards boxes, cabinets, etc., apply a thin line of the preparation all around the sides, forming, as it were, a cordon. No other chemical is required in the cabinet.

If specimens are already infected run some gasoline into the boxes and close them up. This will kill the larvæ and mites in a few minutes. Camphor is utterly useless. In re-papering setting-boards or drawers use a little of the solution in the paste. Be careful not to use methylated spirits.

A. E. Norris, Montreal.

BOOK NOTICES.

Dr. Skinner's Catalogue of North American Butterflies.

It is now nearly fifteen years since Mr. W. H. Edwards issued his "Revised Catalogue of the Diurnal Lepidoptera of America north of Mexico," and it cannot therefore be said that the new "Synonymic Catalogue of the North American Rhopalocera," issued on 15th December last by Dr. Henry Skinner, appeared prematurely. In this catalogue, Dr. Skinner has followed very closely on the lines laid down by Mr. Edwards in his lists, so far as the species are concerned, and with a conservatism which is striking when compared with his rather sweeping radicalism as expressed in his article, "Impressions Received from a Study of our North American Rhopalocera," in Jour. N. Y. Ent. Soc., IV., 107. A few, probably too few, species have been placed in the synonymy, but it seems strange, in view of what the author has written elsewhere, to see Argynnis Artonis, Clio, Opis, Bischoffii, Arge and Eurynome, all standing as distinct species. The order of the families and subfamilies has, however, been entirely changed, following that adopted by the same author in the Check List of 1891, beginning with the Danainæ, and the other Nymphalid subfamilies following in order the Satyrinæ and Libytheinæ closing the series, the Erycinidæ, Lycænidæ, Papilionidæ and Hesperidæ following in the order given.

This grouping of the families, if not altogether satisfactory, and it is not so to the reviewer, seems certainly much more reasonable than that which places at the head as the highest type of butterfly the Satyrinæ, some of the species of which pupate in rudimentary cocoons.

One very excellent feature of the work is the giving a separate line to each reference, which greatly aids the eye in finding what is wanted, but more care might have been exercised in giving the references, as quite a number of errors in the volumes or pages occur. One such error, which may be cited as a sample, occurs on page 52 under Chrysophanus Dorcas, where Scud. But. 3, 1380, should be 1830.

Other misprints occur, at least it seems probable that spelling Phaeton Phæton is chargeable to the printer rather than to the author.

In a few cases references are given which are of less interest than some which have apparently been overlooked, but the citations are so very full that really very little of interest seems to have been omitted.

It will be noticed that under Colias Palæno is placed Var. Werdandi,

Herr.-Schaff. This is following the supplement of Kirby's Catalogue, but Dr. Staudinger and Mr. Elwes give Var. Werdandi, Zett., as a variety of Colias Nastes, Boisd.

The lists of authors and of works quoted are very complete, and the index giving both species and genera, the latter in heavy type, is very satisfactory. Altogether it is a most useful work and really indispensable to every worker on the North American Rhopalocera. It is issued by the American Entomological Society as part of their Transactions, but may be obtained separately from the author for $1.00. H. H. L.

CONTRIBUTIONS TO THE THEORY OF WARNING COLOURS AND MIMICRY. —By Frank Finn, B.A., F. Z. S., Deputy Superintendent of the Indian Museum, Calcutta. (Reprint from the Journal, Asiatic Society of Bengal.) Vols. LXIV., LXV., LXVI., LXVII., Part II., 1895–97.

In this little book of 84 pages, Mr. Finn has brought together a number of separates of his papers, printed in the Journal of the Asiatic Society of Bengal, on this very interesting subject. The experiments were made, largely, with birds, but a lizard, *Calotes versicolor*, was used in one series, and a frog, *Rana tigrina*, and a Tree-Shrew, *Tupaia ferruginea*, in another series; in this last only a single individual of each species being used. The insects experimented upon were mainly butterflies, including largely, of course, such as are supposed to be distasteful or warningly or protectively coloured.

It is obviously impossible to go into the details of the many experiments carried out by Mr. Finn, and, therefore, only a synopsis of the results obtained are included here. As regarding the, in some instances, somewhat unsystematic experiments in the case of birds, Mr. Finn explains that "experimenting on this subject was not always his main object in keeping the birds at all," which leads us to suppose that, sometimes at least, the results given are what might be termed bi-products, which, instead of detracting from their value, might be regarded as adding thereto, as he would certainly be free from all mental bias, so difficult to avoid in cases where one has laboured long and intensely on a very interesting problem.

In regard to the lizard, *Calotes*, he states that "the behaviour of these certainly does not appear to afford support to the belief that the *butterflies*, at any rate, usually considered nauseous, are distasteful to them."

In regard to the *Tupaia*, Mr. Finn states that this animal has a very strong objection to the "protected" *Danainæ* and *Papilio aristolochiæ*, as it so constantly refused them, and in case of the former, absolutely, and not, as with the birds, merely showing dislike by preferring other species. Of the tastes of the frog, sufficient data was not obtained to warrant any conclusions.

Regarding birds (the Babblers especially) the author concludes as follows:

"1. That there is a general appetite for butterflies among insectivorous birds, even though they are rarely seen when wild to attack them."

"2. That many, probably most species, dislike, if not intensely, at any rate in comparison with other butterflies, the 'warningly-coloured' *Danainæ*, *Acræa violæ*, *Delias eucharis*, and *Papilio aristolochiæ*; of these the last being the most distasteful, and the *Danainæ* the least so."

"3. That the mimics of these are at any rate relatively palatable, and that the mimicry is commonly effectual under natural conditions."

"4. That each bird has to separately acquire its experience, and well remembers what it has learned."

"That therefore on the whole, the theory of Wallace and Bates is supported by the facts detailed," in these papers, "so far as they deal with birds (and the one mammal used)." "Professor Poulton's suggestion that animals may be forced by hunger to eat unpalatable forms is also more than confirmed, as the unpalatable forms were commonly eaten without the stimulus of actual hunger—generally," he adds, "without signs of dislike," which shows that, under the stress of hunger, they would likely exhibit even less nicety of selection.

To future experimenters, Mr. Finn offers the following hints, derived from his own experiments:

"1. Use animals at liberty for experimenting with if possible."

"2. If these are not available, confine your subjects singly, and feed them well and *naturally*, letting them be neither hungry nor pampered. Cages should be of portable size (about two feet every way) and made (for birds) of half-inch mesh wire netting with plain wooden floor without a tray. This is to prevent insects from getting out or being concealed."

"3. Use wild-caught specimens in preference to hand-reared ones."

"4. *Remember that the best and often the only way to determine an animal's tastes is to offer it a choice.*"

F. M. Webster.

CORRESPONDENCE.

LARVÆ OF XYELIDÆ.

SIR,—The Wiener Ent. Zeit. for March, 1899 (Vol. XVIII., p. 41). publishes an article by Mr. F. W. Konow, in which my description of *Pleuroneura aviingrata* is attacked. I do not desire to enter any controversy in which the use of abusive language prevails, but as Mr. Konow asks some direct questions about the larva, I propose to answer them for his information. 1. The abdominal feet are present on all the segments, but quite small on the first and ninth, so that from the living larva I did not describe them on these segments ; in the inflated larva they are fairly distinct. Compare Mr. Young's description of *Macroxyela ferruginea* (CAN. ENT., XXXI., 41), where the feet are even more prominent. 2. There are no anal stylets present. 3. The antennæ are 6-jointed, situated just below and a little inward from the eyes. 4. The palpi are visible on the outside of the jaws when these are closed. 5. The length of the mature larva is about 27 mm. 6. Mr. Konow asks how the larvæ may be distinguished from the Lydidæ. I refer to my definition of the Xyelids, CAN. ENT., XXX., 176. HARRISON G. DYAR.

Department of Agriculture,
Victoria, B. C., Feb. 28th, 1899.

To the Editor Canadian Entomologist :

SIR,—I have read with much interest Prof. Enzio Reuter's article in the January number of the CANADIAN ENTOMOLOGIST, referring to the occurrence of the apple fruit miner, Argyresthia conjugella, in Finland, and I think the enclosed letter from Prof. Matsumura, of Japan, may prove of interest to the readers of the CANADIAN ENTOMOLOGIST. You will notice that his account of the Japanese pest, particularly with regard to its attack, tallies very well with what we have observed in British Columbia. The cocoon sent by Prof. Matsumura I am saving, and hope to succeed in breeding the imago next spring. I am unable to determine positively by the cocoon if the insects are identical. I think that the important point as to the mode of egg-laying must be determined before we can feel satisfied with our knowledge of it. All of Prof. Reuter's notes are of great interest to us here, but I cannot help thinking that the mention made of this insect attacking plums is a mistake, some observer having probably confounded the larvæ of *Semasia prunivora* with those of *Argyresthia.* E. A. CAREW-GIBSON,

Imperial Agricultural College,
Sapporo, Japan, Dec. 7, 1898.

DEAR SIR,—I have duly received your letter. Dr. J. Fletcher, of Ottawa, Canada, has already suggested to me that *Larverna herellera* might be identical with your British Columbian *Argyresthia conjugella*, Zell. I have received from him a report concerning it, and am convinced that it must be quite identical. The mode of affecting the plant differs from that of yours, as I have mentioned in a paper published by the U. S. Division of Entomology (Bull 10, U. S. Div. of Ent., 1898), but some larvæ in this country seem to attack the fleshy part of the apple just in the same way as the larvæ of *Trypeta* do, tunnelling in every direction, especially through the superficial part of fruits, and disfiguring them. When an apple is attacked by these larvæ, this fact is manifest on the outside of the fruit by a dusky green track, somewhat depressed, over the tunnels.

Owing to a very wet season this year the insects were scarce, so that I could not obtain many specimens to rear, but I send you a single specimen of the cocoon, which may be of use for identification. I do not think that this insect is indigenous in Japan, but has probably been introduced from some foreign country. Formerly I thought that it must have been introduced from your country, until I was informed by Messrs. Howard and Fletcher that this was very unlikely. *Carpocapsa pomonella*, *Schizoneura lanigera*, *Mytilaspis pomorum*, *Coleophora malivorella*, and *Cacœsia rosaceana*, etc , have all been introduced here from America, and are all of them doing much damage to our horticulturists. I am not yet positive where the eggs are laid, but the first trace of entrance is always on the side, so I naturally assume that the place where the eggs are laid must be on the side. In Sapporo the earliest varieties of apple, such as Fameuse, Red Astrachan, etc., are more liable to be attacked, and the late varieties are less injured. The season during which fruit is liable to injury continues from June to November. I have often found the insect in stored apples even as late as the end of November.

The spraying of trees against this insect is not practised, but in autumn the ground under the affected trees is scratched and raked, so as to expose the cocoons to thawing and freezing. The cocoons are not very deep in the ground, at most about two or three inches. Last year I sent Dr. Howard a single specimen of the imago, and regret that I have not any other good duplicates on hand, but I will send you some next spring if I am successful in rearing. Yours truly,

M. MATSUMURA, Asst. Prof. of Entomology.

To E. A. Carew-Gibson, Victoria, B. C.

Mailed May 3rd, 1899.

The Canadian Entomologist.

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ENTOMOLOGICAL SOCIETY OF ONTARIO.

TORONTO BRANCH.

At the third annual meeting of the Toronto branch of the Entomological Society of Ontario, held in the Normal School Building, on Friday, April 7th, Vice-President Tyers in the chair, the officers were elected for the ensuing year as follows: President, Mr. Arthur Gibson; Vice-President, Mr. E. M. Walker; Secretary-Treasurer, Mr. G. M. Stewart (233 Beverley street); Librarian, Mr. H. C. Austen. Members of Council—Messrs. R. J. Crew and S. R. Carter. The retiring President's address, as read by the Secretary, contained some good suggestions, which, if carried out during the present year, will create more interest in the meetings and be of much benefit to the members.

QUEBEC BRANCH.

The second annual meeting of the Quebec branch was held on Saturday, April 15th, in Morrin College, under the presidency of the Rev. Dr. Fyles. There was a large attendance of members and several new ones were admitted to the branch, raising the number to upwards of forty. The Treasurer's report, which shows a good balance on the right side, was read and adopted.

After the President had delivered his annual address, which was full of interest, the election of officers for the ensuing year took place, and resulted as follows: President, Rev. T. W. Fyles, D. C. L; Vice-President, Miss Macdonald; Secretary-Treasurer, Lt.-Col. Crawford Lindsay; Curator of Museum, Professor Walters. Council—Hon. Richard Turner, M. L. C., Mr. James Geggie and Mr. J. Eveleigh Treffry, Mrs. R. Turner, Miss Bickell, and Miss B. Winfield.

MONTREAL BRANCH.

The twenty-sixth annual meeting of the Montreal branch was held on May 9th, at 74 McTavish street. The President, Mr. Henry H. Lyman, occupied the chair, and ten members and one visitor were present.

The President submitted the annual report of the Council, which recorded with satisfaction the continued success of the branch, alluding to the successful celebration of its twenty-fifth anniversary in November last. Eight meetings had been held during the season and fourteen original papers read. Several of the members had again assisted the Natural History Society in its course of Saturday half-hour lectures to young people.

The Treasurer's report showed a substantial balance on hand, and, on motion, these reports were received and adopted.

Mr. Lyman then delivered his annual address, making it his valedictory, on retiring from the presidency. He reviewed in an interesting manner the past history of the branch, giving statistics to show the progress made and thanking the members for assistance in carrying on the work.

The election of officers was then proceeded with, with the following result: President, Mr. Albert F. Winn; Vice-President, Mr. Dwight Brainerd; Secretary-Treasurer, Mr. Lachlan Gibb (re-elected). Council—Messrs. Henry H. Lyman, G. C. Dunlop, and A. E. Norris.

The retiring President then vacated the chair, which was taken by the new President, who read an interesting paper on "Collecting by Electric Light."

After spending a half-hour pleasantly in the examination of the specimens exhibited by various members and in discussion, a very successful meeting was brought to a close.

FATAL TEMPERATURE FOR DIASPIS AMYGDALI, TRYON.

In the CANADIAN ENTOMOLOGIST, Vol. XXX., pp. 78–80, the writer of this stated that a tree imported from Japan, and badly infested by this Coccid, had been transplanted to the insectary, but the other of the two trees mentioned was not, at that time, properly accounted for. It was planted outside, with a view of ascertaining the lowest degree of temperature that the *Diaspis* could withstand and not be destroyed. The lowest temperature reached in the winter of 1897–98 was – 9° Fahr., but, notwithstanding this, the species wintered over in sufficient numbers to increase considerably over the previous year. During the winter of 1898–99, just passed, the temperature fell to – 21° Fahr. during a single night and to from – 12° to – 18° Fahr. for several successive nights, with the result that the *Diaspis amygdali* appear to have every one succumbed, as not a single living individual can be found on the tree. F. M. WEBSTER.

TWO NEW COCCIDÆ OF THE SUBFAMILY LECANINÆ.

BY ADOLPH HEMPEL, S. PAULO, BRAZIL.

EDWALLIA, n. g.

Apparently related to *Farmairia*, Sign. ♀. Scale waxy, hard, brittle, cone-shaped with radial ridges and furrows. Antennæ five-jointed. Anal-plates curved; the two together forming a ring. Each plate is furnished with ten long hairs. Type, *E. rugosa.*

Edwallia rugosa, n. sp.

♀.—Scale white; wax hard and brittle, cone-shaped, having the appearance of a barnacle, and radially ridged or fluted like the shell of *Pecten*. The base is slightly oval in shape, being wider anteriorly than posteriorly; the anterior side is slightly convex, so that the top of the scale is caudad of the middle. A number of fine concentric rings run around the scale parallel to the base. The inside of the scale is shiny and quite smooth. Adult ♀ fills the entire scale. Derm smooth, lemon-yellow in colour. Around the margin of the body there is a row of about 210 small sharp conical spines, and near the margin on the dorsal surface there is a double row of minute hairs. The stigmatal areas are characterized by one large curved spine, with a round spot at the base; and by a group of from 13 to 19 small round glands. The caudal cleft is very short, each lobe bears a hair longer than the marginal spines. Anal orifice surrounded by a chitinous ring, within which is the anal ring bearing six long hairs. Anal plates curved, irregular, triangular, the dorsal side longer than the ventral side. Each plate bears 10 long hairs, two of which are straight and spinelike; the others are longer and more flexible. Three are situated on the dorsal surface and 7 on the ventral. The plates are so placed that they together form a second anal ring with 20 hairs. Just in front of the anal ring there is a group of about 20 small round spinnerets. Antennæ five-jointed, .12 mm. long. Joint 3 the longest; joints 1 and 5 are about equal in length; joint 4 is about half the length of 3; and joint 2 is the shortest. Formula 31542, or 3(15)42. All the joints bear hairs; joint 3 bears two, one of which is quite long; joint 5 has five hairs. Legs ordinary, coxa and trochanter each with a subterminal hair. Femur wide, with a short sharp spine near the distal end; tibia about as long as femur, the distal end enlarged and bearing one hair; tarsus and claw not quite as long as tibia, two hairs on

the extremity of the tarsus ; claw small, curved. Tarsal digitules very long and slender, with expanded ends ; digitules of claw about half as long as the others, ovate leaf-like. Mentum large, situated midway between the first and second pairs of legs ; rostral loop reaching half way to the third pair of legs. Viviparous. ♀ Scale : height, 3.00 mm.; width, 1.50 mm.; length, 2.75 mm.

Larva, just hatched.—Light yellowish-brown, ovate, margin serrated ; abdomen ending in two inconspicuous lobes, each bearing one long terminal hair. Anal ring with six long hairs ; two short hairs are on the abdomen just in front of the anal ring. The two anal plates are indicated, each with about 6 small hairs. The prothorax and mesothorax each bear a short thick spine on each side of the body. Antennæ apparently five-jointed ; joints 5 and 3 being about equal in length. All the joints bear hairs, joint 5 bearing six, one of which is as long as the antennæ. Legs long ; trochanter with one long subterminal hair ; all the other joints with two hairs or more ; claw long and slender, digitules of unequal length, slightly expanded ; digitules of tarsus very long, hair-like. Four or more longitudinal rows of short spines on the dorsum.

♂.—Scale white, very thin, Lecanid, elliptical, not very convex. Divided into plates, one dorsal, two lateral on each side, and one terminal at each end. The dorsal plate has a crest of broken wax. Length, 1.75 mm.; width, .75 mm.

Hab.—Sao Paulo, Brazil. On the small twigs of *Eugenia jaboticaba*, a tree found in the Brazilian forests, and cultivated for its fruit. I am indebted to Mr. Gustav Edwall for this species. He first found it and called my attention to it. It is not abundant.

PULVINELLA, n. s. g.

Like *Pulvinaria*, except that the ovisac is secreted below the insect, instead of behind it. The ovisac is cone-shaped, and when it is completed, the insect rests upon it like on a cushion.

Type *Pulvinaria (Pulvinella) pulchella*, n. sp.

Pulvinaria (Pulvinella) pulchella, n. sp.

♀ *Adult.*—Shiny, hard, elliptical, dorsum not very convex ; ground-colour dirty white, marbled with black on the ridges near the margin. Derm irregularly transversely wrinkled ; one prominent ridge extends across the dorsum, slightly anterior of the middle. Beneath, chocolate-

brown, except a narrow marginal stripe of dirty white. Caudal cleft about 1 mm. long. Boiled in a solution of KOH, it colours the liquid a dark amber. Antennæ 8-jointed, .48 mm. long. Joint 3 the longest; joints 4 and 5 considerably shorter; joints 1 and 2 about half as long as 3, and the other joints shorter. Formula 3(45)12867. All joints except joint 3 bear hairs. Legs ordinary, coxa with several hairs, and one short, sharp spine near the proximal end; trochanter with one very long apical hair and two short ones; femur stout; tibia not quite so long as femur; tarsus half as long as femur; claw long, stout, curved. Tarsal digitules very long, slender, with knobbed ends; digitules of claw not twice the length of claw, stout with expanded ends. Mentum situated between the fore legs; rostral loop long, reaching half way to the insertion of the last pair of legs. Anal ring with ten long hairs. There is a single marginal row of rather long, slender hairs. Stigmatal spines three, one long, slightly curved, two short and stout. A group of about 50 small round spinnerets is situated around each stigmatal area. Numerous filiform glands are scattered over the ventral surface. Anal plates small, both lateral sides being of equal length. Height, 2 mm.; width, 4.50 mm.; length, 6 mm.

Ovisac cone-shaped, longitudinally fluted with about 16 ridges. The anterior part is secreted faster than the posterior part, so that the anterior edge becomes convex, and when it is completed the insect rests upon it in an oblique position. The ridges are closer together on the posterior edge than on the anterior. The colour is white with a faint creamy tinge. Length, 5 mm.; width, 3.75 mm.; height, 7 mm.

Larva, just hatched.—Light brown, elliptical. Margin of body finely serrated; a short hair is situated on each side of the body at each abdominal segment; eight short hairs on the anterior margin between the antennæ. The body is terminated posteriorly by two long setæ and several small hairs. The prothorax and mesothorax each bear a long, straight spine, on the margin, on each side of the body. Antennæ long, six-jointed, three the longest, and six the next; the other joints subequal in length. Legs ordinary, tarsal digitules long, slender, with slightly expanded ends; one of them as long as tarsus. Claw long, curved; digitules of claw slender, with expanded ends. Rostral loop long, reaching to the anal cleft.

Hab.—Ypiranga, State of Sao Paulo, Brazil. On small twigs of *Baccharis,* sp. Not common.

SOUTHERN NOCTUIDS AT RYE, N. Y.

BY HENRY BIRD, RYE, N. Y.

Remarks in a recent issue of this magazine concerning "A Southerner arrested in Canada" recall some of the additions made to my local list during the summer of 1898. In this instance also some stragglers from a lower latitude were welcomed among my catch. Not only a few Noctuids but some of the birds also bore a Southern aspect (I cannot be expected to pass the birds unnoticed), most unusual among the latter being the appearance of several blue herons that frequented the salt marshes here for the better part of the summer. These waders are more at home in the swamps of Florida, although this is not the limit of their northern migrations by any means, yet they are considered great rarities here by the local sportsmen.

Whether the climatic conditions were such as to induce the visitations, or whether the great quantity of gunpowder that was burned down South caused them to be in evidence, I will not attempt to explain.

In the case of the heron the gunpowder suggestion might have a little weight, but the freshness of my Noctuids points rather to a permanent residence on their part.

Worthy of especial mention among these is *Eucalyptera bipuncta*, Morr.

In the only previous reference to this species in former volumes (Vol. XV., 230) the insect is discussed concerning its position generically and is compared with *Scolecocampa liburna* and *Doryodes acutaria*. As one unfamiliar with the species could get but a poor conception from these associations, and as the literature is in no way burdened with references to this insect, I will mention a few points descriptive of its general appearance.

In my specimen, a male, the form is very slight, palpi prominent projecting forward and upward, the antennæ show extremely fine pectinations under a pocket magnifier. The colour is light smoky gray, the secondaries a trifle the darker. The transverse posterior line is the only conspicuous marking of the primaries, is strongly indicated, smoky brown, and curves well outwardly near the costa, but does not in my specimen reach the costal vein.

Two small, black dots, suggestive of the name, are noticeable, one—the larger—indicating the orbicular, and the other, very minute, equi-

distant between it and the t. p. line. The secondaries are without markings. The insect expands twenty-two millimeters, and was taken at light, Aug. 10th.

Another species of perhaps rarer occurrence was *Atethmia rectifascia*, Grt. My acquisition of the latter was in this wise: While assisting a lady friend, who had just begun collecting, in naming a very fair two-months' catch one evening last August, our attention was drawn to a small moth that had flown in at the open window and was resting on the window shade. The question, "Oh! what is that one?" was too much for the oracle, and with an apologetic hint that it was something very good, I was presented with the specimen for further deliberations.

Here was another instance of the good luck that generally befalls beginners in having rarities come their way. I have noticed it repeatedly and recall my only capture of *Eutelia pulcherrima*, Grt., in the earliest days of my entomological experience.

How it is that the specimen which I still possess has passed through the vicissitudes of the "cigar-box" collection, the ornamental display case on the wall, and lastly the transference from an unusually large, common pin, is more than can be imagined. And yet it stands a very passable example in my collection, antennæ-less and leg-less to be sure, but for all that the most prized specimen that I have.

Through the last ten years, since knowing what species it represents, a constant lookout for others has been kept, but without success, and I have begun to wonder if it will be necessary for me to begin all over again in order to secure another example.

Regarding *rectifascia*, a word as to appearance may not be amiss, as no mention of the species has thus far been made in the CANADIAN ENTOMOLOGIST. Since its description in 1874, the generic position has been twice changed by Prof. J. B. Smith, to whom I am indebted for the identification of my example. This species is of rather slight build, with wings full and normally developed, having a thin, silky vestiture that at first suggested to me (very wrongly) that it might have a position somewhere *Acontia*-ward. The antennæ are simple, eyes and palpi prominent, the latter projecting upward. The primaries are a pale, shining olivaceous, crossed by three lines or fasciæ, as in the case of *Chloridea rhexia*, S. & A. The first of these, which is nearer the middle of the wing than usual for the transverse anterior line, is about at right angles

with the inner margin. The second or transverse posterior line is more oblique, bending outward near the costa and with a more pronounced sweep than the following. The third or subterminal is margined inwardly with a faintly darker shade of the ground-colour. The extreme outer margin and fringes show a golden lustre. The reniform is indicated by a straight mark of the same pale shade as the lines, and is at right angles with, though not touching, the costa. At the outer margin, near, but not on, veins three and four are two minute black dots. In a description of this insect in Trans. Am. Ent. Soc., X., 247, no mention is made of these dots and they may be perhaps a sexual characteristic.

The secondaries are lighter, discoloured white, of the same lustrous sheen, shading darker at the outer margin, but with fringes less golden than primaries. Expanse, twenty-four millimeters.

Other captures, referable generally to a more southern fauna, are *Polygrammate hebraicum*, Hbn.; *Laphygma frugiperda*, S. & A.; *Prodenia eudiopta*, Gn.; *Plusia basigera*, Walk.; *Schinia lynx*, Gn.; *S. Thoreaui*, G. & R.

WINTER BREEDING OF DIABROTICA VITTATA IN FORCING HOUSES.

In the "Journal of the New York Entomological Society" for June, 1896 (Vol. IV., No. 2, p. 68), the present writer recorded the occurrence, on December 28, 1895, of adults, and larvæ from one-half to two-thirds grown, of *Diabrotica vittata*, in a greenhouse near Cincinnati, Ohio, that was being used for growing cucumbers for winter market. The injuries inflicted upon the young cucumber plants were very serious, and resulted in a nearly total destruction of the plants. On March 25, 1899, serious injuries were again reported by the proprietors of these same greenhouses, and the complaint was accompanied by specimens of what, to all appearances, were the larvæ of this same species. These larvæ were placed on the roots of a squash plant growing in the insectary, and on the morning of April 24th the adults made their appearance, thus showing that, under proper conditions, the species will continue to reproduce the year round, whereas out of doors, and under normal conditions, the insect hibernates in the adult stage. F. M. Webster.

Dr. A. Fenyes, of Pasadena, California, has set forth on a collecting tour in Mexico, Texas, New Mexico and Colorado, and expects to be absent for five months.

THE SYNHALONIA OF CALIFORNIA.

BY CARROLL FOWLER, BERKELEY, CAL.

The material for this study was collected by Mr. H. O. Woodworth and myself during the spring and early summer of 1898. At Berkeley the collecting was carried on in a systematic manner, so that the number of each species taken gives a fair representation of their relative abundance. S. albicans and S. Edwardsii are the only species heretofore recorded from California. The species may be readily recognized by means of the following synopsis :

Abdomen with distinct, white bands.

Small, not more than .25 in. in length.....albicans.

At least .40 in. in length.

Thorax with white pubescence, rather thin on disc.....californica, ♀.

Thorax with dense, reddish-brown pubescence....speciosa, ♀.

Abdomen not distinctly banded.

Pale pubescence of the abdomen confined to the first segment.

Thorax with dense, brownish pubescence.....acerba.

Thorax with rather thin white pubescence.....albopilosa, ♂.

Pale pubescence extending more or less upon second abdominal segment.

Third joint of the antennæ shorter than the first.....Edwardsii, ♂.

Third joint as long as the first and second combined..intrudens, ♂.

1. Synhalonia albicans, Prov. San Gabriel, Cal. (H. O. Woodworth), June 23. Twelve specimens.

2. Synhalonia californica, n. sp.

11 mm. Clothed with ashy pubescence, abdomen with white bands.

♀.—Head black, clothed with ashy pubescence; clypeus nude, coarsely punctured; antennæ entirely black. Thorax black, opaque, very finely punctured, clothed with ashy pubescence, a little thinner on the disc; tegulæ reddish-yellow; wings very slightly clouded; legs clothed with white pubescence, dense on posterior tibiæ and tarsi, more or less yellowish on tarsi beneath; apical joints of tarsi brownish. Abdomen black, very finely punctured, narrow apical margins of the segments brownish; first segment clothed with erect pale hairs, on base of second indistinct and sometimes wanting, and on apical margins of 2-5 a band of white appressed pubescence, brownish on middle of fifth. Ventral segments fringed with white hairs.

Habitat.—Berkeley, Cal., May 1 and 9. Thirteen specimens.

3. Synhalonia speciosa, Cress. Berkeley, Cal., April 26 to May 1. Two females. Previously recorded from Colorado.

4. Synhalonia acerba, Cress. ♀.

♂.—Differs from ♀ in having the clypeus and labrum yellow, the antennæ reaching back to the second abdominal segment and crenulated toward tips (third joint is shorter than the first), and the legs clothed with pale pubescence. The pubescence of the thorax, as in some females, is strongly tinged with fulvous. The male is readily distinguished from Edwardsii by having no pale pubescence on the second abdominal segment.

Berkeley, Cal., six specimens; and San Mateo Co., Cal., two specimens. April and May. Collected upon Brassica campestris and Ranunculus californicus. Previously recorded from Nevada.

5. Synhalonia albopilosa, n. sp.

13 mm. Thorax small, clothed with white pubescence; abdomen large, oval.

♂.—Head black, punctured, clothed with griseous pubescence, thin on clypeus; clypeus, except upper margin, and labrum, yellow; antennæ entirely black, reaching slightly beyond the second abdominal segment, crenulated toward tips, third joint shorter than the first. Thorax black, finely punctured, not as broad as abdomen, clothed with rather long, white pubescence, not entirely concealing the surface; tegula black in front, brownish behind; wings hyaline; legs clothed with pale pubescence, apical joints of the tarsi brownish, intermediate tarsi long and slender. Abdomen oval, broader than the thorax, black, shining, finely punctured, apical margins of the segments pale brown; first segment with thin, erect, white hair, 2–5 with short, thin, black pubescence, a very little white on the sides of the second, and that on 6–7 dark brown. Venter almost nude, otherwise as above.

Habitat.—Berkeley, Cal., April 18. One specimen, collected upon Ranunculus californicus.

6. Synhalonia Edwardsii, Cress. Berkeley, Cal., March 15 to May 9. Sixteen males, collected upon Brassica campestris, Ranunculus californicus, and Malvastrum capense, in botanic garden.

7. Synhalonia intrudens, Cress. Berkeley, Cal. March, fourteen males; and April 26, one male. Tulare, Cal. (H. O. Woodworth), May 10, three males. Collected chiefly upon Brassica campestris. Previously recorded from Nevada.

CONTRIBUTIONS TO THE KNOWLEDGE OF MASSACHUSETTS COCCIDÆ.—II.

BY GEO. B. KING, LAWRENCE, MASS.

Orthezinæ.

(21) *Orthezia insignis*, Dougl.; 1887–1892. I.

Found at Amherst and Cambridge, Mass., in greenhouses. A very general feeder on greenhouse plants. It is recorded from New York, Pennsylvania, and California.

Lecaniinæ.

(22) *Kermes galliformis*, Riley; 1881–1897. N.

A very abundant species at Lawrence, Methuen, Andover, Haverhill, and Dracot, Mass., on white, black, red, and scrub oaks. It is recorded from Ohio, Colorado, New Mexico, New York, and Oklahoma. In Massachusetts it is attacked by a Lepidopterous larva, *Euclemensia bassettella*, and a new species of *Encyrtus* has been reared from it in large numbers. It is attended by a number of species of ants, the following already observed: *Formica subsericea*, Say.; *F. obscuripes*, For.; *Camponotus pennsylvanica*, Deg.; *Cremastogaster lineolata*, Say.; and *Lasius americanus*, Em. In the spring of 1898 one adult female was found under a stone in a nest of *Formica subsericea*, Say, at Andover, Mass.

(23) *Kermes pubescens*, Bogue; 1898–1898. N.

This is found to be quite destructive to young white oaks at Lawrence, Andover, and Methuen, Mass. It is parasited by *Microterys cincticornis*, Ashm. The coccid was first described from Kansas.

(24) *Kermes nivalis*, King and Ckll.; 1898–1898. N.

A very pretty species and comparatively rare. Covered with a snow-like meal which soon disappears after the young begin to move about. It is found on *Quercus alba* at Lawrence, Mass.

(25) *Kermes Kingii*, Ckll.; 1898–1898. N.

Like the above, quite rare and handsome. Found at Lawrence, Mass., on red oak. Prof. Gillette has sent Prof. Cockerell specimens collected in Delaware.

(26) *Lecanopsis lineolata*, King and Ckll.; 1897–1897. N.

Found in the nest of *Cremastogaster lineolata*, Say, at Lawrence, Mass.

(27) *Lecanium hesperidum*, L.; 1758–1828. I. Described as *Coccus hesperidum.*

Very common in greenhouses, and a pest not only in greenhouses, but also to many plants in dwelling houses at Lawrence, Mass.; on ferns, palms, ivy, and many other plants not yet identified; recorded from Utah, Ohio, California, Florida, Georgia, New York, New Jersey, and Washington, D. C.

(28) *Lecanium coffeæ*, Walk.; –1896. I. Syn. *hemisphæricum*, Targ.

A first-class pest on greenhouse plants at Lawrence, Mass.; on ferns and several other plants not determined. It is reported from Cambridge, Maine, New Jersey, New Mexico, California, Pennsylvania, and Washington, D. C., on Orange, Diospyros, Oleander, Chrysophyllum, Sago palm, and *Croton variegatum.*

(29) *Lecanium quercifex*, Fitch. 1856–1898. N.

On white oak at Lawrence, Mass. Parasited by a new species of *Coccophagus.* Originally described from New York.

(30) *Lecanium quercifex*, Fitch, var.; 1898. N.

At Methuen, Mass.; on cork oak and an ornamental shrub. It is parasited by *Aphycus lecanii*, How.

(31) *Lecanium filicum*, Boisd.; 1868–1869. I.

According to Dr. Packard it has been found in greenhouses frequently. Prof. Cockerell informs me that this is only a variety of L. coffeæ.

(32) *Lecanium corylifex*, Fitch; 1856–1898. N.

A very common species at Lawrence, Andover, and Methuen, Mass.; on hazelnut, *Corylus americana*, and is attended by *Cremastogaster lineolata*, Say. It is parasited by *Aphycus lecanii*, How., *Cornys fusca*, How., *Microterys*, sp. A new genus, near *Chrysoplatycerus*, and a *Tetrastichus*, sp. (Hyperparasite), were found with one lot. The Coccid was originally described from New York.

(33) *Lecanium cynosbati*, Fitch; 1856–1898. N. Syn. Caryæ, Sign.

From Methuen, Mass.; on three-thorned locust, *Gleditschia triacanthos.* It is attended by *Formica subsericea*, Say. Originally described from New York.

(34) *Lecanium tessellatum*, Sign; 1873–1898. I.

Found by Mr. J. W. Folsom in the botanic gardens at Cambridge, Mass. (Ckll. in litt.).

(35) *Lecanium Kingii*, Ckll.; 1898–1898. N.

Quite frequently found on high-bush blueberry, *Vaccinium corymbosum*, L.; at Lawrence, Mass.

(36) *Lecanium tarsale*, Sign.; 1873, var. 1898. N.

On dogwood, *Cornus alternifolia*, at Lawrence, Methuen, and Andover, Mass. Generally found on the trunk of the trees, seldom on the limbs. It is parasitized by *Blastothrix longipennis*, How.

(37) *Lecanium Fletcheri*, Ckll.; 1893–1898. N.

At Lawrence, Mass., on *Arbor vitæ*. It is found at New York by Mr. Pettit and was described from Ottawa, Canada. Found there by Dr. Fletcher on cedar.

(38) *Lecanium nigrofasciatum*, Perg.; 1898–1897. N.

Found at Methuen, Boston, Springfield, Holyoke, and Deerfield, Mass., on *Acer rubrum* and *Acer saccharinum*; also found at Washington, D. C.; Maryland, Georgia, Tennessee, Pennsylvania, New Jersey, New York, Delaware, Ohio, Missouri, Illinois, and Florida. It is parasitized by Aphycus flaviceps, How. Dr. Howard, who has had all the parasites reared by me for study, reports to me (in litt.) that these specimens were badly shrivelled, so he could not make the determination with absolute certainty, and that the parasite has been previously reared from *Lecanium* by Prof. W. G. Johnson at Champaign, Ill. Dr. Dimmock informs me that some of the trees were very badly infested by this scale, which has been nearly exterminated at Springfield by a parasite. The food plants in other localities are olive, *vaccinium*, plum, apple, peach, birch, maple, Bumelia and *Lindera benzoin*. It also occurs in Western Ontario, Canada, on maple.

(39) *Lecanium pallidior*, Ckll. and King; 1899–1898. N.

On a young native white cedar, *Chamæcyparis thyoides*, at Methuen, Mass.

(40) *Lecanium caryæ*, Fitch; 1856–1898. N.

At Lawrence and Methuen, Mass.; on pignut hickory and wild red cherry. The writer has endeavored to find the original type of Fitch's species. At present it looks as though there are none to be found. Prof. Cockerell will in the near future redescribe the species, as it is very much confused with many others, owing to the very short and incomplete description by Fitch. The unrecognized *Lecanium platycerii* described by Dr. Packard in 1869, said to be common in greenhouses in Massachusetts, was probably *Lecanium coffeæ*, Walk.

(41) *Lecanium (Saissetia) anthurii*, Boisduval; 1868, var.

This insect was referred to Mr. Cockerell, who supplies the following remarks:

"Length 2, breadth 1½, height little over ½ mm.; pale reddish-brown to brownish ochreous, broad oval in outline, fairly convex, shiny; with weak ridges forming an H, as in the *oleæ* group; these ridges marked, as in *Beaumontiæ*, by rows of waxen or glossy patches. Dermal structure as in *coffeæ*, and exactly as Signoret figures for *anthurii*. Marginal bristles of two sizes, about 24 and 39 μ. Legs a little larger than *coffeæ*; coxa 150, femur with trochanter 180, tibia 135, tarsus 84, claw 20, claw-digitules 30, tarsal digitules 52 μ. Tarsal digitules filiform, with a small knob. Claw strongly curved, its digitules bulbous at base, and with large round knobs at the end. Antennæ practically as in *coffeæ*; segments, (1.)39, (2.)42, (3.)54, (4.)42, (5.)39, (6.)30, (7.)24, (8.)36 μ. Formula: 3(24)(15)867. This is evidently very close to *L. coffeæ*, but the specimens seem to be adult, and in that case they cannot belong to that species. They very nearly agree with *anthurii* as described by Signoret, but are half a mm. shorter, and very much flatter; the tibia also is not twice as long as the tarsus, as it should be in *anthurii*. In many respects the insect is very like *L. Beaumontiæ*, as described by Douglas, but the description is very inadequate. The present insect was found by Mr. King on grass in a greenhouse, so its native country is uncertain. On the whole, it seems more discreet to leave it as '*anthurii*, var.' than to give a new specific name." (Cockerell, litt., March 23, 1899.) Originally found on Anthurium (Ckll. in litt.).

(42) *Pulvinaria innumerabilis*, Rathv.; 1854–1869. N. Syn. *Acericorticis*, Fitch.

Quite frequently found through the State on maples and perhaps on other food plants, and is preyed upon by *Hyperaspis signatus* and *Chilocorus bivulnerus*; an *Encyrtus* sp., *Aphycus* sp., and *Chiloneurus albicornis*, How., have been reared from it. Recorded from Washington, D. C.; Virginia, New Jersey, New York, Maryland, Pennsylvania, Georgia, Indiana, Illinois, Colorado, Washington, Utah, Oregon, Ohio, Florida, Kansas, Missouri, Michigan, New Mexico, Nebraska, and Western Nevada, on box elder, maple, locust, elm, woodbine, currant, gooseberry, plum, peach, hawthorn, mountain ash, Lombardy poplar, weeping willow, upland willow, swamp willow, flowering currant, osage orange, oak, linden, rose, hackberry, sycamore, spindle tree, beech, and

sumac. There is much doubt about the identity of the species on all of the above food plants. The only way to be sure about these *Pulvinaria* spp. will be to get a large number, say 25 or 50, of each and measure all the antennæ and legs. (Ckll. in litt.)

(43) *Pulvinaria innumerabilis*, var. tiliæ; King and Ckll.; 1898–1898.

A variety readily recognized from *innumerabilis* by the colour of the female scale, which is gray with several black spots, giving it a mottled appearance. Found at Methuen and Lawrence, Mass., on *Tilia americana*, white oak, and elm.

(44) *Pulvinaria Macluræ*, Kennicott in Fitch; 1855–1898. N.

What I take to be this species is found on Sumac. It is the largest of the *Pulvinaria* type found here, and not very often found. It has been recorded from New York, New Mexico, and Pennsylvania, on Osage orange.

(45) *Lichtensia viburni*, Sign.; 1873–1898. I.

The species is new to America and was found at Lawrence, Andover, and Methuen, Mass., on leaves of *Spiræa salicifolia*, L., and *Prinos verticillatus*. It is parasitized by *Aphycus Lounsburyi*, How. Dr. Howard, who has so kindly determined all the parasites of my rearing from coccids, also says (in litt.) that he agrees with me that the supposed *Pulvinaria innumerabilis* from different localities and food plants needs further study.

THE MEDITERRANEAN FLOUR MOTH AGAIN.

BY PROF. W. G. JOHNSON, COLLEGE PARK, MD.

Some few weeks ago I had an inquiry referred to me by the Editor of the *American Miller* from a Canadian correspondent, who stated that the flour moth was less than fourteen miles away from his mill, in Wellington (Ontario) district. I contributed a short article regarding this moth in the May number of the *American Miller*, in response to which two other localities have been discovered. One comes from York district, along the Lake, and one from Leeds district, along the St. Lawrence River. It seems clear to me that this insect is spreading along the watercourses of the lakes and inland along the railroads. Four other cases were reported to me, with larvæ and pupæ from each, from the United States side, one coming from Ohio, the first reported from that State, and three from New York. I also have one from Southern California. In every instance the pest has maintained its former reputation as a most dangerous insect.

TAENIOCAMPA RUBRESCENS, Walk.

BY J. ALSTON MOFFAT, LONDON, ONT.

This interesting species has at last been added to the collection of the Entomological Society of Ontario, by the industrious collecting of Mr. J. W. Bice, who took it at electric light in the season of 1898, and was recently identified for me by Dr. J. B. Smith. *Taeniocampa alia*, Guen. —*incerta*, Hubn.—was in remarkable profusion during the early part of that season; and ranging through an extent of variation that was quite confusing. Three good specimens of *rubrescens* were taken at the same time, each differing from the other in colour, and were picked out as possibly another variety of *alia*, but when seen by Dr. Smith, he pronounced my Nos. 3, 4, 5 to be *T. rubrescens*, and his remark on them was, "A very pretty series, No. 4 being a new form to me."

It seems to be a somewhat rare moth. I find that it was first described and named by Walker in 1865, from a specimen in Dr. Bethune's collection, and from there it has been transferred to the U. S. National Museum, where it is now deposited as the type of the species. As late as 1890, Dr. Smith redescribed it in *Entomologica Americana*, Vol. VI., p. 123, as *T. venata*, from a single specimen taken by Mr. Bruce many years before, and concludes his remarks upon it thus: "I have never seen anything to match this species, and do not think it can be readily confused with any of the described forms." But he afterwards discovered that Mr. Walker had been there before him. Dr. Smith regards it as distinctly a northern species, it never having been taken as far south as New Jersey. In his 1893 Catalogue of the Noctuidæ found in Boreal America, he gives its habitat as "Canada, New Hampshire, northern New York." One would suppose that a northern species would have far less difficulty in spreading southward than a southern one would northward, unless severely restricted in its food plant. Henry Edwards gives the food plants of T. incerta, Hubn., as "*Quercus, Salix, Prunus.*" That of *T. rubrescens* may be similar, but I have not found any reference to it, and collecting at light is not conducive to the discovery of food plants.

A fine pair of *T. subterminata*, Smith, was added to the collection at the same time, and in the same way.

CLASSIFICATION OF THE ENTOMOPHILOUS WASPS, OR THE SUPERFAMILY SPHEGOIDEA.

BY WILLIAM H. ASHMEAD, ASSISTANT CURATOR, DIVISION OF INSECTS, U. S. NATIONAL MUSEUM.

(Paper No. 1.)

In the Journal of the New York Entomological Society for March, 1899, I separated the Hymenoptera into ten superfamilies, viz.: I. Apoidea, II. Sphegoidea, III. Vespoidea, IV. Formicoidea, V. Proctotrypoidea, VI. Cynipoidea, VII. Chalcidoidea, VIII. Ichneumonoidea, IX. Siricoidea, and X. Tenthredinoidea.

In the following pages I now propose to give a classification of the second of these superfamilies, or the Sphegoidea, a large group of wasps at one time confused with the genuine fossorial wasps, but which may be readily separated from them by having the hind angles of the pronotum not extending back to the tegulæ. Of all wasps these are the ones most closely allied to the bees.

Some of the best entomologists of the past — Leach, Dahlbom, Haliday, Westwood, and others — held that the group represented many distinct families; but quite recently some of our modern systematic workers — men of the highest attainments and ability — hold quite different views, treat this vast group as a single family, and would suppress or merge into a single genus many genera that were formerly considered good and distinct.

To use a slang expression, it is the old battle between the "lumpers" and the "splitters" revived, and the evolutionary problems taking place around us are ignored or misunderstood.

I believe firmly both schools, if we may call them such, are honest in their beliefs; but since I belong to the latter, it seems to me as if the students in the former were restrained or misled by affinities, or relationships, often obscure and indefinable, and overlook the fact that evolutionary changes have already been accomplished; and, because they

find certain affinities, would treat all of these important changes that have occurred through ages of evolutionary forces as of no value or significance.

This tendency to lumping I consider a retrogression in our systematic workers, tending to confusion and to unwarrantable changes in our nomenclature ; and it is to combat this tendency and make an effort to restore to their proper standing these suppressed families and genera, in accordance with the views held by the older entomologists, that I present herewith, in tabular form, the only possible way of demonstrating thoroughly the value and utility of divisions and genera, my ideas on the classification of this great group of wasps.

Before proceeding with my tables, however, and in order to afford a basis of comparison with my own views, it may be well to call attention to the views of two leading hymenopterists who have given much time and study to this group of wasps, namely, Mr. Wm. J. Fox, of the Philadelphia Academy of Sciences, and Dr. Franz Kohl, of the Royal Hofmuseums of Vienna, Austria.

In 1894, Mr. Fox, following the opinion of some of the recent European authorities, in his paper entitled "A Proposed Classification of the Fossorial Hymenoptera of North America," treats these wasps as representing a single family. He says : "It has been evident for some time that the existing arrangement, that contained in Cresson's Synopsis, is of little value, as it is too superficial. Entirely too many families, without characters to substantiate them, were recognized. The Sphegidæ, for instance, were divided into no less than nine families. Accepting these nine families would, it seems to me, necessitate the erection of families for such genera as Neolarra, Bothynostethus, Trypoxylon, and others, which stand more or less isolated and yet possess characters which connect them in one way or another with the formerly existing families, and would form more distinct families were they recognized than, say, the Mellinidæ, Ampulicidæ, Nyssonidæ or Bembicidæ. How these nine

supposed families have been disposed of the following pages will show."

Mr. Fox then proceeds with his classification of the Fossores *without*, however, giving a table for recognizing these families or even mentioning the salient characters that would distinguish them. He has not even given a single character for distinguishing this so-called family, Sphegidæ, but begins by saying: "I would divide this vast family into five subfamilies as follows: Spheginæ, Pemphredoninæ, Bembicinæ, Oxybelinæ, and Crabroninæ."

Fox then goes on and separates these five subfamilies into tribes: The Spheginæ he separates into two tribes, Sphegini and Ampulicini, upon most superficial and totally unreliable characters when the exotic forms are considered; the Pemphredoninæ into two tribes, Psenini and Pemphredonini; the Bembicinæ, a most conglomerate mixture, into thirteen tribes, Philanthini, Mellinini, Nyssonini, Stizini, Bembicini, Neolarrini, Bothynostethini, Astatini, Diploplectrini, Miscophini, Larrini, and Trypoxylonini; while the Crabroninæ and Oxybelinæ are without tribes.

The Oxybelinæ were first separated from the Crabronidæ in 1874 by the Swedish entomoligist, C. G. Thompson. I believe they represent a distinct family and have so treated them in my work.

In 1896, Dr. Franz Kohl, who had, however, years before published much on these wasps, published his "Die Gattungen der Sphegiden," a most valuable work, in which he treats these wasps as belonging to a single large family, the Sphegidæ, which he divides into generic groups, allied groups, subgenera and species groups.

The work is a masterpiece and should be in the hands of all students of these wasps.

Dr. Kohl recognized nine generic groups, arranged in the following sequence:

GENERIC GROUPS.	SUBGENERIC GROUPS.	ALLIED GROUPS.	SUBGENERA.	SPECIES GROUPS
I. Crabro	Crabro, s. l.	Crabro, s. str.	Crabro, Kohl.	
			Rhopalum, Kohl.	
			Brachymerus, Dahlb.	
			Lindenius	Lindenius, Dahlb.
				Entomognathus, Dahlb
				Encopognathus, Kohl.
		Anacrabro, Pack.		
	Oxybelus, Latr.	Belomicrus, Costa.	Belomicrus, Costa., s. str.	
			Oxybelomorpha, Brauns.	
		Oxybelus, Costa., s. str.		
II. Pison, Jurine	Pison, Jur., s. l.	Pison, Jur., s. l.	Parapison.	
			Pison.	
		Aulacophilus, Smith.		
		Trypoxylon, Ltr.		
	Pisonopsis, Fox.			
III. Miscophus, Jur.	Nilela, Latr.			
	Solierella, Spin.	Sylaon, Pisc.		
		Solierella spinolæ, Kohl.		
		Solierella chilensis, Kohl.		
		Nitelopsis, Saund.		
	Plenocalus, Fox.			
	Miscophus, Jur.	Miscophus	Miscophus (genuine).	
			Miscophus chrysis, Kohl.	
			Miscophus handlischii, Kohl.	
		Soliostethus, Brauns.		
		Miscophus, Brauns.		

	Lyroda, Say.	
	Tachytes, Pauz., s. l.	Gastrosericus, Spin. Homogambrus, Kohl. Parapiagetia, Kohl. Prosopigastra, Costa. Tachysphex, Kohl. Tachytes, Pauz.
IV. Larra, Fabr.		Ancistromma, Fox.
	Larra, F., s. l.	Larraxena, Sm. Larra, Fabr. Motes, Kohl. Paraliris, Kohl. Notogonia, Costa. Liris, Fabr. Piagetia, Rits.
	Laphyragogus, Kohl.	Laphyragogus, Kohl. Leianthrena, Bingham.
	Dinetus, Jur.	
	Palarus, Latr.	
	Sericophorus	Helioryctes, Sm. Sericophorus, Sm. (Shuck.) Sphodrotes, Kohl.
V.	Zoyphium, Kohl.	
Astata, Kohl.	Astata, Latr.	Astata, Spin. Dryudella, Spin.
	Isolated.	
	Diploplectron, Fox.	

GENERIC GROUPS.	SUBGENERIC GROUPS.	ALLIED GROUPS.	SUBGENERA.
	Isolated.		
	Heliocausus, Kohl.		
VI. Bembex, Fab.	Bembex	Bembex, Fab.	
		Microbembex, Patt.	
		Bembidula, Burm.	
		Steniolia, Say.	
		Monedula, Latr.	
	Stizus, Latr.	Stizus, Handl.	
		Handlirschia, Kohl.	
		Sphecius, Dahlb.	
	Exeirus, Shuck.		
	Kohlia, Handl. (Isol.)		
	Gorytes, Ltr. (Hdl.) (Isol.)		
	Entomosericus, Dahlb. (Isol.)		
	Mellinus, Fab. (Isol.)		
VII. Alyson, Jur.	Alyson, Jurine, s. l.		Alyson, Jur., s. str.
			Didineis, Wesm.
	Bothynostethus, Kohl, s. l.	Bothynostethus, Kohl.	
		Scapheutes, Handl.	
	Nyson, Latr. (Isolated)		Nysson.
			Hyponysson, Cress.
			Acanthostethus, Sm.
VIII. Philanthus, Fabr.	Philanthus, Kohl., s. l.	Philanthus, Kohl., s. str.	Philanthus, Kohl.
			Anthophilus, Dahlb.
		Trachypus, Klug.	
		Philoponus, Klug.	
		Aphilanthops, Patt.	
	Cerceris, Latr., s. l.	Cerceris, Latr.	Cerceris, Dhlb. (genuine).
			Nectanebus, Spin.
			Didesmus, Dahlb.
		Eucerceris, Cress.	

- IX. Sphex, L.
 - Sceliphron, Ill. (Kby.), s. l.
 - Sceliphron, Ill., s. str.
 - Pelopoeus, i. sp.
 - Sceliphron.
 - Chalybion, Dahlb.
 - Podium, Fabr., s. l.
 - Podium, Fabr., s. str.
 - Dynatus, Spin.
 - Trigonopsis, Perty.
 - Ammophila, Kirby
 - Ammophila, Dahlb
 - Ammophila, Kohl.
 - Parapsammophila, Tschbg.
 - Psammophila, Dahlb.
 - Chlorion, Fabr.
 - Sphex, L., s. l.
 - Harpactopus
 - Pseudosphex, Tschbg.
 - Calosphex, Kohl.
 - Parasphex, Smith.
 - Palmodes, Kohl.
 - Gastrosphaeria, Costa.
 - Isodontia, Patt.
 - Sphex, s. str.
- X. Ampulex, Jur.
 - Ampulex, Jur., s. l.
 - Aphelotoma, Westw.
 - Ampulex, Jur., s. str.
 - Rhinopsis, Westw.
 - Ampulex, Jur. (genuine).
 - Trirogma, Westw.
 - Dolichurus, Latr.
- XI. Pemphredon
 - Psen, Kohl.
 - Psen, Latr., s. str.
 - Psen, Ltr.(genuine)=Mesopora Wesm. = Dahlbomia, Wesm.
 - Psen annulipes, Com.
 - Mimesa, Wesm.
 - Aporia, Wesm.
 - Psenulus, Kohl (= Psen, Dahlb.)
 - Pemphredon, Ltr
 - Pemphredon, Shuck.
 - Ceratophorus, Shuck.
 - Diphlebus, Westm.
 - Passaloeus, Shuck., s. l.
 - Passaloecus, Shuck., s. str.
 - Polemistus, Sauss.
 - Diodontus, Curt. (Isol.)
 - Harpactophilus, Sm. (Isol.)
 - Stigmus, Kohl.
 - Stigmus, Jur., st. Pauz.
 - Spilomena, Shuck.
 - Ammoplanus, Gir.

Every one must and will appreciate the immense work performed by Dr. Kohl in this contribution, and I feel sure the thanks of all working hymenopterologists go out to him for it. His tables are excellent, and with these and the fine figures of venation, representing nearly every known genus, no student will have any difficulty in placing in its proper genus any of these wasps he may capture, provided they are described.

I think, however, some will take exception to his peculiar views in regard to the rank and value he has given his generic groups, subgeneric groups, allied groups, subgenera and species groups. Nor do I think they will always agree with him in his arrangement of some of these groups. In some cases, at least, according to my views, he has not been successful in showing the true affinities of the groups, and has brought into juxtaposition groups and genera that are widely separated. For instance, I do not consider his group Pemphredon (representing the old family Pemphredonidæ) to have any affinity whatever with Ampulex (Ampulicidæ), next to which he has placed it.

Other similar incongruities might be pointed out, but since my views in regard to the rank, affinities and arrangement of these wasps are incorporated in the following tables, it will not be necessary to call attention to them here; they will become apparent in my table, and may be readily detected on a comparison of my arrangement with his.

My arrangement of the families recognized is as follows:

Superfamily II.—Sphegoidea.

Table of Families.

Middle tibiæ always with two apical spurs. 5.

Middle tibiæ with only one apical spur (occasionally absent in some males).

Median cell in hind wings not twice as long as the submedian, the latter often the longer; front wings with two or three submarginal cells; if with one only the head transverse, not quadrate . . 2.

Median cell in hind wings fully twice as long as the submedian; front wings with only one submarginal cell, very rarely with an indistinctly defined areolet.

Head transverse, the temples not very broad; scutellum margined, the postscutellum armed with a spine, thorn or forked process and with squamæ; front wings with the

first discoidal cell obliterated, rarely distinct, most frequently confluent with the second discoidal cell.....Family XV., Oxybelidæ.

Head large, quadrate or trapezoidal, the temples very broad; scutellum normal, the postscutellum unarmed without squamæ; front wings with the first discoidal cell always distinct, separated from the second...Family XVI., Crabronidæ.

2. Abdomen with a strong constriction between the first and second segments; eyes often emarginate within.....4.

Abdomen without a strong constriction between the first and second segments; eyes most frequently normal, rarely emarginate within.

Abdomen sessile, never petiolate.....3.

Abdomen petiolate or subpetiolate; cubitus in hind wings usually originating before the transverse median nervure, more rarely interstitial or originating slightly beyond it; transverse median nervure not sinuate ♂-shaped; ocelli distinct; labrum most frequently hidden, rarely triangularly exserted, never free.....Family XVII., Pemphredonidæ.

3. Labrum large, free, well developed and triangularly elongated, much longer than wide; cubitus in hind wings usually originating beyond the transverse median nervure, the latter sinuate or somewhat ♂-shaped; ocelli aborted, represented by cicatrices.....Family XVIII., Bembicidæ.

Labrum small, not free, usually completely hidden by the clypeus; cubitus in hind wings most frequently originating beyond the transverse median nervure, the latter straight, not ♂-shaped; mandibles often emarginate on under side; ocelli distinct or at most with the lateral or hind ocelli aborted or wanting, indicated by cicatrices; front wings with a distinct stigma.....Family XIX., Larridæ.

4. Head wider than the thorax, the temples not narrow, rather broad; eyes most frequently normal; rarely deeply emarginate within, although often slightly emarginate within; abdomen most frequently sessile or subsessile, rarely petiolate (*Tachypus*, Klug), not elongate, ovate or oblong-oval, and most frequently with a deep constriction between the segments, or at least always with a constriction between the first and second; front wings with three submarginal cells, the second often petiolate, the second and third each receiving a

recurrent nervure; cubitus in hind wings variable, interstitial or nearly, or originating far beyond the transverse median nervure.....Family XX., Philanthidæ.

Head not wider than the thorax, the temples very narrow or flat; eyes always deeply emarginate within, or reniform; abdomen elongate, clavate, the first segment elongate, petioliform; front wings with two submarginal cells, the second, however, usually more or less indistinct or subobsolete; cubitus in hind wings originating beyond the transverse median nervure.....Family XXI., Trypoxylidæ.

5. Abdomen without a constriction between the first and second segments; intermediate coxæ not contiguous.....6.

Abdomen with a more or less distinct constriction between the first and second segments, the first segment coarctate; intermediate coxæ contiguous; mesosternal suture wanting.....Family XXII., Mellinidæ.

6. Mesosternum produced into a forked process posteriorly; mesepisternum not separated; mesonotum with distinct parapsidal furrows.....8.

Mesosternum normal, not produced into a forked process posteriorly; mesepisternum separated; mesonotum without parapsidal furrows, or at most only vaguely defined.

Abdomen distinctly petiolated.....7.

Abdomen sessile or subsessile.

Labrum not free, entirely covered by the clypeus, or at most with only its apex visible; cubitus in hind wings originating *before* the transverse median nervure, rarely slightly beyond it, the latter most frequently straight, rarely sinuate or somewhat ♂-shaped.....Family XXIII., Nyssonidæ.

Labrum free, well developed, subtriangular or semicircular, wider than long; cubitus in hind wings originating usually before the transverse median nervure, the latter strongly sinuate or somewhat ♂-shaped; ocelli distinct.....Family XXIV., Stizidæ.

7. Clypeus never produced posteriorly between the antennæ, the latter inserted above the base of the clypeus; metathorax most frequently rounded posteriorly, very rarely with acute angles; cubitus in hind

wings variable, most frequently originating *beyond* the transverse median nervure, more rarely interstitial . . Family XXV., Sphegidæ.

8. Clypeus posteriorly usually carinate or produced between the insertion of the antennæ so that its basal margin is beyond a line drawn from their base; anteriorly it is often rostriform carinate, or at least more or less produced medially; metathorax usually long, abruptly truncate posteriorly with the angles acute or toothed, although sometimes the angles are rounded; pronotum rather long, conically produced Family XXVI., Ampulicidæ.

CORRESPONDENCE.

Spilosoma congrua, Walk.

Sir,—As I understand the Rev. Mr. Fyles's recent article on *Spilosoma congrua*, it is contended (1) that *S. congrua*, of Walker, is the same as *S. antigone*, Strecker, and (2) that *cunea*, Drury, is also *antigone*, not *textor*, Harris.

To the former proposition I am inclined to assent on the following grounds:

1. Grote, who made the first examination of Walker's specimens, recognized in them a distinct species.

2. Walker knew *cunea*, Dru., and well separated it from his *congrua* in these words (Cat. Brit. Mus., III., 667):

A. Alæ anticæ albæ.

B. Abdomen non maculatum.

a. Alæ sat angustæ. *cunea*, Drury.

b. Alæ latæ. *congrua*, Walker.

3. Prof. Smith's statement (Ent. Amer., V., 119), that Walker's description of *congrua* does not apply to *antigone* was doubtless due to his not having before him any specimens of Mr. Fyles's variety "f."

We may then return to the old synonymy of the species:

S. congrua, Walk.

antigone, Strk.

The larva has been described in the following places:

1870. Saunders, Can. Ent., III., 36 (as *H. cunea*).

1886. Hulst. Ent. Amer., II., 15.

1889. Soule & Elliot, Psyche, V., 263.

1895. Packard, Journ. N. Y. Ent. Soc., III., 177.
1897. Dyar, Journ. N. Y. Ent. Soc., V., 131.
1899. Fyles, Can. Ent., XXXI., 101.

I am familiar with the larva, as I have found it at Keene Valley and Rhinebeck, New York, and Fort Lee, New Jersey. My larvæ had six stages, not five, as given by Mr. Fyles. The widths of head were .35, .5, .8, 1.3 to 1.45, 2 to 2.2, 2.7 to 3 mm. The full-grown larva corresponds with his description, but occasionally a striking variety occurs, in which the incisures dorsally are banded with pale yellow, somewhat in the manner of *Ecpantheria scribonia*.

To Mr. Fyles's second proposition I would positively dissent:

1. Walker knew *cunea* and separated it by a good character from *congrua*.

2. Southern specimens of *cunea* are larger than the dwarfed ones from the north with which Mr. Fyles is familiar, and it is absurd to suppose that after giving an account of the life-history of the webworm, Dr. Riley should have figured only moths coming from a black, ground-feeding larva *(congrua)*. Besides, Dr. Riley's moths are still in the National Museum and are structurally Hyphantria, while, previous to my taking charge of the collection, the Museum had but two specimens of *congrua* (Dr. Riley's collection had none), neither of which could have served for the published figures of *cunea*.

3. In markings, *cunea* and *congrua* may be practically alike. The differences reside principally in the structural characters of the number of spurs on the hind tibiæ and the wing shape.

4. Mr. Saunders's description of the larva of *cunea* as black and feeding on the ground, was simply due to a misidentification of the imago.

Therefore the synonymy of this species may be:

H. cunea, Dru.
punctatissima, S. & A.
punctata, Fitch.
pallida, Pack.
var. budea, Hübn.
textor, Harr.
candida, Walk.

Numerous references to the larva will be found in Bull. 35, U. S. N. M.

Harrison G. Dyar.

BOOK NOTICES.

A Natural History of the British Lepidoptera.—By J. W. Tutt, F. E. S.; Vol. I. Swan, Sonnenschein & Co., London, 1899.

In this excellent work of 560 pages the first twelve chapters are devoted to the origin of the Lepidoptera; the ovum or egg; the embryology of a lepidopterous larva; parthenogenesis, external and internal structure of a lepidopterous larva; variation of the imagines; protective coloration and defensive structures of lepidopterous larvæ and classification of the Lepidoptera, with a plate on which is given a phylogenetic tree, illustrating the development of the lepidopter from a hypothetical base. Part II. is devoted to the Sphingo-micropterygid stirps, the Mycropterygids, the Nepticulides, the Cochlidides and the Anthrocerides.

This first volume on the British Lepidoptera is a model in its way, and gives promise that when the entire work is completed little will be left to be desired. One would have expected a chapter on the pupal stage following that on the larva, but probably this will appear in a future volume, as well as the anatomical structure of the imago. The subjects in the first part are dealt with very fully, and it would almost appear that every writer of importance had been culled from, yet the work is not entirely a compilation, for the author's own observations and conclusions are everywhere in evidence.

The subjects of the second part are even more exhaustively treated than those in the first, which is very proper in a work of this character. Six pages and a half are devoted to the first insect dealt with, *Micropteryx calthella*, L., under the headings: synonymy, original description, imago, sexual dimorphism, variation, comparison with other species, egg-laying, ovum, habits of larva, larva, cocoon, pupa, food-plant, habitat, time of appearance, localities and distribution. It is rather discouraging to the student of North American micros to see how full and complete a history is given of these insects in England, while our knowledge of the species in this country stands in comparison to what remains to be learned like small and remote oases in the great desert. It is impossible to do justice to a work of this character in the short space that can be allowed, but no worker on the Lepidoptera should be without it.

C. H. Fernald.

Catalogue of the Lepidoptera Phalænæ in the British Museum, Vol. I., Syntomidæ.—By Sir George F. Hampson, Bart., London. Printed by order of the Trustees, 1898.

This work, on the general plan of the old British Museum catalogues, avoids all the objections that have been urged against that work. The British Museum authorities are especially fortunate in possessing the services of so thorough and accurate a worker as Sir George Hampson. The volumes are really monographs of the families treated, all species that have been described being included, and not only those represented in the British Museum. In this respect the title fails to do the work justice. A set of plates accompanies the volume, but under a separate cover, which is explained on page vii. of the preface. A synoptic table of the genera is given and of the species in each genus, a description of each species with bibliography and the larvæ when known. An introduction of fifteen pages deals with the general characters of the Lepidoptera in all stages. The author recognizes fifty-two families of Lepidoptera, and he has arranged them in the form of genealogical tree. It would take altogether too much space to discuss this tree in full, but it may be said that it presents many good points, as well as others against which objections can be urged. A key to the families follows.

The Syntomidæ of the world are made to comprise one hundred and sixty-eight genera, and eleven hundred and eighty-four species, of which by far the greater portion are from the tropics of South America. The family runs into the Arctiidæ, it being stated (page 20) that no very exact lines can be drawn between them. Under these conditions it is not surprising that certain genera are included, which, in the opinion of the reviewer, are Arctiidæ. A large table showing the phylogeny of the genera is given, necessarily without reference to the larval characters, as only about one and one-half per cent. of the larvæ of this family have ever been described. The table is without explanation, except the short discussion on page 21, which refers indirectly to it. The few North American species of the Syntomidæ are arranged as follows :

477 *Cosmosoma auge*, Linn.

569 *Pseudomya minima*, Grt.

It is gratifying to have this species at last placed correctly.

679 *Syntomeida ipomeæ*, Harr.

My partial description of the larva of this species is not referred to. (Boston Soc. Nat. Hist., XXVII., 138.)

680 *Syntomeida epilais*, Walk.

797 *Didasys balæ*, Grt.
The larva is unknown.

923 *Lymire Edwardsi*, Grt.
This is the *Scepsis Edwardsii*, at times so destructive to the rubber banyan tree of Florida; transferred to one of Walker's genera.

928 *Horama texana*, Grt.
The larva is unknown.

1117 *Eucereon confine*, H. S.
Nelphe carolina, Hy. Edw., is made a synonym of this, the larva being unknown.

1148 *Scepsis fulvicollis*, Hübn.
Under this heading *Packardii*, Grt., is recognized as a variety only. The larva is not referred to, though it has been described by Coquillett. (Can. Ent., XII., 44.)

1149 *Scepsis Wrightii*, Str.
Coquillett's notes on the pupa (Journ. N. Y. Ent. Soc., VI., 249) were published too late for insertion.

1150 *Propyria Schausi*, Dyar.
This is referred from the United States under a misapprehension, unless the British Museum possesses specimens from our country. The types are two specimens in the Edwards collection from Jalapa, Mexico, and I do not know of the occurrence of this species further north.

1152 *Lycomorpha Grotei*, Pack.
The larva is unknown.

1153 *Lycomorpha fulgens*, Hy. Edw.
The larva is unknown.

1154 *Lycomorpha pholus*, Dru.

1165 *Ctenucha venosa*, Walk.
Cressonana, Grt., is made a synonym, certainly erroneously, as it is larger, broader winged, the fringe of both wings continuously white outwardly, the wing markings narrower and paler yellow; the palpi are red on the sides except the terminal joint, not on the under side only as in *venosa*. The larva is unknown. Dr. Packard has published notes on a supposed larva of *Cressonana* (Ann. N. Y. Acad. Sci., VIII., 89).

1166 *Ctenucha sanguinaria*, Strk.
Wrongly credited to Stretch instead of Strecker. This is much more likely to be a variety of *Cressonana* than the latter to be related to *venosa* at all closely. The larva is unknown.

1168 *Ctenucha brunnea*, Str.
The larva is unknown.

1169 *Ctenucha multifaria*, Walk.
The larva is unknown.

1170 *Ctenucha rubroscapus*, Mén.
The larva is unknown.

1171 *Ctenucha virginica*, Charp.

1174 *Dahana atripennis*, Grt.
The larva is unknown.

Erruca pertyi is shown to be a Brazilian insect.

The larvæ of the North American species are known in 43 per cent.

Finally, when it is remembered that the genera of the Syntomidæ were heretofore in almost inextricable confusion, the great value of this publication to working entomologists may be appreciated. The undertaking of a series of monographs of the families of the Lepidoptera of the world, by a competent author, is one of the most important aids to entomology that has ever been produced, and it is entirely fitting that these should emanate from the British Museum. HARRISON G. DYAR.

MR. ARTHUR GIBSON, who has been for three years Secretary and is now President of the Toronto branch and a Director of the Entomological Society of Ontario, has recently been appointed assistant to Dr. James Fletcher, Entomologist and Botanist of the Experimental Farms of the Dominion.

It is with much regret that we record the death of EDWARD WINSLOW CROSS, youngest son of Judge and Mrs. David Cross, which took place at his home in Manchester, N. H., on the 23rd of April. He was a young man of great promise, being only in his 24th year, and was studying law with earnest application at the Harvard Law School up to a fortnight before his death. Two years ago he graduated from Amherst College, Mass. He was an ardent entomologist and had formed a remarkably fine collection of Geometridæ. To his parents and family we beg to offer our respectful sympathy.

Mailed June 2nd, 1899.

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CLASSIFICATION OF THE ENTOMOPHILOUS WASPS, OR THE SUPERFAMILY SPHEGOIDEA.

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(Paper No. 2.)

Family XV.—Oxybelidæ.

Unquestionably, this group is closely related to the *Crabronidæ*, where most authorities have placed it; but, to me, the quite different shaped head, the absence of the basal abscissa of the cubitus in the front wings, and the remarkable formation of the scutellum and postscutellum, characters not found in any other group, seem to justify one in separating it from the Crabronidæ and treating it as a distinct family.

The group was first recognized as a subfamily in 1874, by C. G. Thomson, in his Skandinaviens Hymenoptera, Vol. III., p. 256.

The species prey upon small flies (Diptera), which they store up in their burrows made in loose sandy soil.

The known genera are not numerous, and may be recognized with the aid of the following table:

Table of Genera.

Mandibles beneath *not* emarginate, rarely with an indistinct median incision; submedian cell as long or very nearly as long as the median, the transverse median nervure interstitial, or nearly, with the basal nervure, or at most uniting with the median vein not much before its origin 2.

Mandibles distinctly emarginate beneath; submedian cell very much shorter than the median, the transverse median nervure uniting with the median vein much before the origin of the basal nervure.

Pygidium triangular with a distinct pygidial area, the hypopygidium very narrow.(1) Oxybelomorpha, Brauns.

2. Marginal cell at apex pointed, or at least not distinctly truncate; mesopleura rounded, not sharply margined anteriorly; lateral ocelli as near or nearer to the front ocellus than to the eye margin; clypeus simple in both sexes. (2) Belomicrus, Costa.

Marginal cell at apex distinctly truncate; mesopleura sharply margined anteriorly; lateral ocelli usually nearer to the eye margin than to the front ocellus.

Mandibles *with* a median tooth within; postscutellar spine acute or bluntly rounded at apex, never emarginate; clypeus in ♀ truncate, in ♂ tridentate. (3) Oxybelus, Latreille.

Mandibles *without* a median tooth within; postscutellar spine long, broad and always emarginate at apex; clypeus in ♀ truncate, in ♂ 4- or 5-dentate. (4) Notoglossa, Dahlbom.

The North American species will fall in the following genera:

(1) Oxybelomorpha, Brauns.
None.

(2) Belomicrus, Costa.
(1) B. Forbesii, Robt.
(2) B. cladothricis, Ckll.
(3) B. argenteospilus, Cam.

(3) Oxybelus, Latreille.
(1) O. uniglumis, Linn.
(2) O. quadrinotatus, Say.
(3) O. similis, Cress.
(4) O. quadricolor, Ckll. et B.
(5) O. subulatus, Robt.
(6) O. cornutus, Robt.
(7) O. subcornutus, Ckll.
(8) O. punctatus, Baker.
(9) O. rejectus, Bak.
(10) O. striatus, Bak.
(11) O. Packardii, Robt.
(12) O. sericeus, Robt.
(13) O. laetus, Say.
(14) O. fulvipes, Robb.
(15) O. niger, Robb.
(16) O. Cressonii, Robt.
(17) O. heterolepis, Ckll. et B.
(18) O. dejectus, Ckll. et B.
(19) O. acutus, Bak.
(20) O. Robertsonii, Bak.
(21) O. varicoloratus, Bak.
(22) O. hirsutus, Bak.

(4) Notoglossa, Dahlbom.
(1) N. mexicanus, Robb.
(2) N. bugabensis, Cam.
(3) N. longispina, Cam.
(4) N. azteca, Cam.
(5) N. sparidens, Ckll.
(6) N. Cockerellii, Bak.
(7) N. trifidus, Ckll. et B.*
(8) N. dilutus, Bak.
(9) N. intermedius, Bak.
(10) N. emarginatus, Say.
(11) N. coloradensis, Bak.
(12) N. abdominalis, Bak.
(13) N. frontalis, Robb.

* This is founded upon a mutilated specimen, having the squama broken so as to appear trifid.

Family XVI.—Crabronidæ.

The much larger head, which is quadrate or trapezoidal, with very broad temples, the normally-shaped scutellums and the venation of the front wings—the first and second discoidal cells always being distinctly separated, never confluent—readily distinguish the family from the Oxybelidæ; while from the Pemphredonidæ, the only other family to which it shows any affinity, it is at once separated by the venation of the front wings and the *much longer median cell in the hind wings*.

In my studies on the genera of this family as well as many of the other families, I am greatly indebted to my friend, Mr. Wm. J. Fox, of the Philadelphia Academy of Sciences, who most generously placed at my disposal such of his types and other material needed.

In this family I have recognized five distinct groups, which I call subfamilies, although they are much closer related than some of the subfamilies in other families. These may be distinguishable by the aid of the following table:

Table of Subfamilies.

Abdomen beneath *not* flat, either convex or subconvex and laterally rounded, not acute or carinate, the dorsal segments usually normal, rarely distinctly constricted at the sutures; second discoidal cell not much longer than the first, often shorter and not very narrow.....2.

Abdomen sessile, beneath *very* flat, and laterally acute or carinate, the dorsal segments with a constriction at the sutures and margined at apex; transverse median nervure in front wings uniting with the median vein *far* before the origin of the basal nervure, the second discoidal cell, in consequence, being very long and narrow, much longer than the first discoidal cell; first recurrent nervure joining the first cubital cell at or near the middle; mesopleura sharply margined anteriorly and posteriorly, and the carina of same connected with a carina along the sides of the mesosternum; mandibles at apex edentate acute; maxillary palpi 6-, labial 4-jointed..Subfamily I., Anacrabroninæ.

2. Mandibles at apex simple, edentate; maxillary palpi 6-, labial palpi 4-jointed; first recurrent nervure received by the first cubital cell at or near the middle, never very far beyond the middle.....Subfamily II., Lindeniinæ.

Mandibles at apex 2- or 3-dentate, rarely truncate and indistinctly bidentate in a few females; never, however, acute, as in the *Anacrobroninæ* and the *Lindeniinæ*.

Abdomen petiolate, or the first segment longly petioliform; the first segment always long and *without* a delicate carina laterally, or at least the lateral carinæ are not sharply defined, much abbreviated, and never extend to the apex of the segment...4.

Abdomen always sessile, never petiolate or with the first segment petioliform; the first segment never very long and always with distinct lateral carinæ that extend clear to the apex of the segment; maxillary palpi 6-jointed, labial palpi 3- or 4-jointed; antennæ in ♀ 12-, in ♂ 12- or 13-jointed..... 3.

3. Mesopleura *with* a distinct ridge, carina or crest before the middle coxæ; recurrent nervure in front wings joining the cubitus always *far* beyond the middle of the first cubital cell, at about its apical fourth or fifth; antennæ in both sexes 12-jointed, the flagellum in the ♂ not fringed with fine hairs beneath; ocelli, except very rarely, arranged in an obtuse triangle . ˙ ., the lateral ocelli being about twice as wide from each other as to the front ocellus or nearly; mesonotum and usually also the mesopleura coarsely sculptured; metathorax more or less coarsely sculptured, opaque or subopaque, never smooth, the cordate area on the posterior face wanting or at most indistinctly defined.....Subfamily III., Crabroninæ.

4. Mesopleura *without* a ridge, carina or crest before the middle coxæ, at most, and rarely, with only a pointed tubercle; recurrent nervure joining the cubitus at or near the middle of the first cubital cell or somewhat beyond the middle, or at the most never beyond its apical third; antennæ in ♀ 12-jointed, in ♂ 13-jointed, the flagellum in the latter usually fringed beneath with fine hairs; metathorax as a rule less coarsely sculptured than in the Crabroninæ, often smooth, shining, the cordate area on the posterior face distinct or indistinctly defined, never entirely wanting.....Subfamily IV., Thyreopinæ.

3. Mandibles bidentate, rarely 3-dentate or bluntly truncate in ♀; maxillary palpi most frequently 5-jointed, rarely 6-jointed, the labial palpi 3- or 4-jointed; first recurrent nervure in front wings received by the first cubital cell at or near the middle, rarely much beyond the middle.....Subfamily V., Rhopalinæ.

Subfamily I.—Anacrabroninæ.

The characters made use of in my table of families easily separate this subfamily from the others, the formation of the mesopleura and

abdomen and the long narrow second discoidal cell being quite characteristic and totally different from the other groups.

The group is quite isolated and apparently peculiar to North America.

Only a single genus is known, and with the characters already given, may be distinguished as follows:

Marginal cell in front wings a little longer than the first cubital cell, broadly truncate at apex; head transverse, the temples broad, but not quite as wide as the eyes, the hind orbits bounded by a distinct long carina posteriorly.....Anacrabro, Packard.

[Type A. ocellatus, Pack.]

North American Species.

(1) ANACRABRO, Packard.

(1) A. ocellatus, Pack.

(2) A. boerhaviæ, Ckll.

SUBFAMILY II.—Lindeniinæ.

This subfamily agrees with the *Anacrabroninæ* in its mandibular characteristics, but otherwise shows little affinity, the other characters being similar to those in the three subfamilies which follow. From these, however, it is readily separated by the mandibles being acute or rounded at apex and always edentate. In venation it agrees more nearly with Rhopalinæ, the first recurrent nervure, as in that group, being received by the first cubital cell at or near the middle, but the abdomen is sessile and not petiolate or clavate.

Only three genera are known, distinguished by the aid of the following table:

Table of Genera.

Mandibles not emarginate beneath; antennal foveæ not wider from each other than to the eyes.....2.

Mandibles emarginate beneath; antennal foveæ wider from each other than to the eyes.

Eyes hairy; mandibles with two teeth or tubercles within towards base; scutellum with the basal furrow bifoveolated; recurrent nervure uniting with the cubitus distinctly beyond the middle of the first cubital cell; transverse cubitus joining the marginal cell beyond the middle; anal lobe in hind wings extending beyond the short submedian cell; mesosternum without a ridge before the middle coxæ.....Entomognathus, Dahlb.

[Type E. brevis, Lind.]

Eyes bare; mandibles not bituberculate within; scutellum not bifoveolate at base; recurrent nervure received by the first cubital cell beyond its middle; anal lobe in hind wing not extending beyond the submedian cell; mesosternum with a strong ridge before the middle coxæ.... Encopognathus, Kohl.
[Type E. Braueri, Kohl.]

2. Recurrent nervure received by the first cubital cell at or near its middle; transverse cubitus joining the marginal cell a little before its middle; anal lobe in hind wings extending beyond the short submedian cell..... Lindenius, Lepeletier et Br.
[Type L. argentatus, Lep. et Br.]

North American Species.

(2) Entomognathus, Dahlb.
(1) E. texanus, Cr.

(3) Encopognathus, Kohl.
None.

(4) Lindenius, Lepel. et Br.
(1) L. errans, Fox.
(2) L. latifrons, Fox.
(3) L. armaticeps, Fox.
(4) L. flaviclypeus, Fox.
(5) L. pinguis, Fox.
(6) L. salicis, Ckll. (Ammoplanus).

Subfamily III.—Crabroninæ.

This group is probably the most extensive one in the family, the species, as a rule, being larger and more gaily coloured than those of the other groups.

The subfamily is readily separated from the others by the very distinct ridge, crest or carina on the mesopleura just before the middle coxæ, a character first pointed out, I think, by Dr. Kohl, and by the first recurrent nervure entering the first cubital cell near its apex, or at its apical fourth or fifth.

Table of Genera.

Males: mandibles at apex always bidentate 10.
Females:
Mandibles at apex bidentate, rarely truncate and indistinctly bidentate; pygidium in ♀ triangular, above flat, never deeply exca-

vated and without a well-defined pygidial area, the lateral carinæ being never highly elevated; ocelli in an obtuse triangle 8.

Mandibles at apex tridentate; pygidium narrowed towards apex, subogival, and deeply channelled or excavated, with a well-defined narrowed pygidial area, the lateral carinæ high; if triangular, which is rare, excavated.

Mandibles *without* a tooth within towards base 7.

Mandibles *with* a distinct tooth or blunt process within towards base 2.

2. Superorbital foveæ wanting or indicated only by a slight glabrous streak or depression near the upper border of the eyes 4.

Superorbital foveæ sharply defined, long, linear or oblong.

Abdomen not strongly punctate, except sometimes the first segment; smooth, polished, impunctate or coriaceous, or finely, sparsely, minutely or microscopically punctate; the dorsal segments, except sometimes the first, not constricted at the sutures, nor delicately margined at apex 3.

Abdomen distinctly and more or less strongly punctate, the dorsal segments more or less constricted at sutures and usually delicately margined at apex, or at least some of the basal segments are margined.

Thorax rather coarsely strongly punctate, the punctures more or less confluent, and sometimes with striæ or fine acicu-lations on the mesonotum posteriorly, the scutellum and the meso- and metapleura; metanotum reticulated or with sharply defined striæ; clypeus with a median ridge or carinæ and quadrately produced medially, the apex of same being truncate or submarginate; head large, quadrate, rather coarsely confluently punctate Solenius, Lepel. et Br.

[Type S. interruptus, L. et Br.]

3. Head and thorax coarsely sculptured or coarsely rugoso-punctate, the mesonotum posteriorly, the scutellum and the mesopleura superiorly somewhat striate; metapleura opaque, longitudinally acicu-lated; abdomen with the first segment rather strongly punctate, the following smooth, at the most sparsely punctate; clypeus with a strong median ridge, which is strongly narrowly (not broadly as in *Solenius*) produced beyond the anterior margin, while on each side of it, or between the production and the eyes, is a

tooth or tubercle, so that the clypeus anteriorly appears tridentate Thyreus, Lepel. et Br.

{ Type C. clypeatus, Schb., ♀. }
{ = C. vexillatus, ♂. }

4. Scrobes normal, *not* bounded by a transverse carina superiorly. ...5.
Scrobes deep, *bounded* by a transverse carina superiorly.

Mesonotum rather coarsely confluently punctate, but without longitudinal aciculations, except sometimes slightly posteriorly and on the scutellum, the mesopleura at the most with some striæ superiorly; metathorax at sides and posteriorly striated, the metanotal area coarsely retriculated or alveolate; third antennal joint longer than the fourth, scarcely twice as long as the pedicel, joints 4–5 about equal; abdomen shining, at the most sparsely microscopically punctate Ectemnius, Dahlb.

[Type C. guttatus, Lind.]

5. Mesonotum *not* longitudinally striate or aciculate, either finely or coarsely punctate; clypeus more or less strongly produced medially at apex 6.

Mesonotum longitudinally striate or aciculate, as well as the scutellum, the mesopleura and the metathorax, the anterior part of the mesonotum especially laterally more or less transversely striate; clypeus not strongly produced medially, but with a median ridge or carina on its disk; third joint of antennæ long, about as long as joints 4–5 united; abdomen shining or subopaque, finely coriaceous, or microscopically punctate, the first segment highly polished Crabro, Fabr.

[Tpye C. fossorius, Linne.]

6. Mesonotum on disk and posteriorly sparsely punctate, but anteriorly and at sides closely confluently punctate, subopaque; mesopleura neither strongly nor distinctly striate, except superiorly; metathorax with the basal area punctate, not striate, the posterior face rugulose, slightly striate at apex, the pleura smooth, delicately aciculated; clypeus similar to *Crabro;* third antennal joint not so elongate but longer than the fourth; abdomen finely coriaceous and microscopically punctate Hypocrabro, Ashm., n. g.

[Type C. 10-maculatus, Say.]

Mesonotum closely confluently punctate, opaque or subopaque, the mesopleura and metathorax, including the basal area, strongly striate; clypeus similar to *Crabro*.

Third antennal joint about as long as joints 4–5 united, or nearly thrice as long as the pedicel or second joint; abdomen shining, but minutely or microscopically punctate, the punctures of first segment a little larger..... Pseudocrabro, Ashm., n. g.
[Type C. chrysarginus, Lepel.]

Third antennal joint much shorter than joints 4–5 united.

Abdomen, or at least the basal segment, highly polished, impunctate, or at most sparsely microscopically punctate; pygidial area much narrowed, deeply excavate and fully twice as long as wide at base; first joint of flagellum twice as long as the pedicel Xestocrabro, Ashm., n. g.
[Type C. 6-maculatus, Say.]

Abdomen distinctly, minutely (somewhat sparsely) punctate; pygidial area more nearly triangular, and not twice as long as wide at base; first joint of flagellum only a little longer than the pedicel..... Xylocrabro, Ashm., n. g.
[Type C. stirpicola, Pack.]

7. Ocelli in an obtuse triangle . ˙ ., the lateral ocelli being about twice as wide from each other as to the front ocellus, or nearly; third antennal joint not especially long; thorax sculptured as in *Solenius;* abdomen smooth, impunctate or at most feebly microscopically punctate Metacrabro, Ashm., n. g.
[Type C. Kollari, Dahlb.]

Ocelli in an equilateral triangle . ˙ . or nearly, the lateral ocelli being not or very little farther from each other than to the front ocellus; superorbital foveæ wanting, never sharply defined, at most represented by a slight glabrous streak near the eye margin; thorax finely closely punctate, opaque, the meso- and metapleura striated; abdomen smooth, impunctate or at most microscopically coriaceously sculptured; third antennal joint elongate, as long or longer than joints 4–5 united..... Clytochrysus, Morawitz.
[Type C. sexcinctus, H. Schf.]

8. Mandibles with a tooth within near the middle or towards the base.

Superorbital foveæ very distinct, sharply defined, elongate or linear, dull at bottom..... 9.

Superorbital foveæ wanting or at most indicated only by a slight, scarcely perceptible glabrous depression or streak; third antennal joint long, about as long as joints 4–5 united or a little longer;

clypeus with a median ridge or carina; thorax rather coarsely closely punctate, the mesopleura striate and punctate; metathorax at sides, as well as its posterior face, striate or aciculate, sometimes very coarsely, the metanotal area with oblique striæ; abdomen finely but distinctly, minutely punctate. . Protothyreopus, Ashm., n. g.
[Type C. rufifemur, Pack.]

9. Clypeus medially strongly quadrately produced, with a tooth on each side between the median production and the eyes; thorax rather coarsely punctured or sculptured, shining or at most subopaque; metanotum coarsely reticulate, subopaque, the metapleura and posterior face densely striate; abdomen shining, the basal segment very distinctly punctate, the following segments less densely, more minutely or microscopically punctate; mandibles truncate, indistinctly bidentate at apex; anterior tarsi with fine short bristles beneath, the first joint slender, much longer than 2–5 united; face except scrobes and the clypeus clothed with a silvery pubescence. Ceratocolus, Lepel. et Br.
[Type C. alatus, Panz.]

10. Mandibles *with* a tooth within towards base; ocelli, unless otherwise mentioned, arranged in an obtuse triangle . ' . , the lateral ocelli being very much farther from each other than to the front ocellus 11.

Mandibles *without* a tooth within towards base; ocelli arranged in a triangle . ' . ; superorbital foveæ wanting; clypeus produced medially; first flagellar joint elongate, beneath excised so as to appear bidentate. Clytochrysus, Morawitz.
[Type sexcinctus, H. Schf.]

11. Superorbital foveæ wanting or at most not sharply defined, indicated only by a slight glabrous depression or streak in the sculpture close to the eye margin. 14.

Superorbital foveæ always distinct, sharply defined, elongate or linear. 12.

12. Front femora unarmed beneath *at base* 13.

Front femora armed with a tooth, angulation or sharp ridge beneath *at base*.

Front tarsi simple, not dilated; middle tibial spur rarely distinct; flagellar joints simple, *not* emarginate beneath; thorax coarsely confluently punctate; abdomen strongly or distinctly

punctate, the dorsal segments somewhat constricted at the sutures and usually delicately margined at apex; head quadrate, coarsely punctate.....Solenius, Lep. et Br.

[Type S. interruptus, Lep.]

Front tarsi broadly dilated, the tibiæ also dilated and clothed with dense white hairs behind; middle femora compressed into a lamina beneath at base; abdomen distinctly punctate; head seen from above obtrapezoidal, from in front much longer than wide Ceratocolus, Lep. (pars.).

13. Front tarsi depressed or dilated, the basal joint being depressed or broad and often with a broad lamina or shield-like expansion; middle tibiæ without an apical spur.

Head normal, almost quadrate; front tarsi depressed but not very broad; middle legs normal; antennæ with the flagellar joints short, 3–12 with white obtusely rounded, blister-like elevations beneath; abdomen distinctly punctate Hypothyreus, Ashm., n. g.

[Type C. subterraneus, Fabr.]

Head usually much narrowed behind, seen from in front much longer than wide, seen from above obtrapezoidal, the temples very broad but converging behind; front tarsi broadly dilated, the basal joint with a broad lamina or shield-like expansion and longer than the following joints united.

Anterior femora and tibiæ clothed with a white pubescence beneath, often forming a long flocculus.

Front tarsal joints emarginate at apex; antennæ with joints 3–5 almost equal, the joints of the flagellum with blister-like elevations beneath..Thyreus, Lepel.

[Type C. clypeatus, Sch.]

Front tarsal joints not emarginate at apex; antennæ normal, joints 4–5 equal or nearly, the third longer Ceratocolus, Lepel.

[Type C. alatus, Panz.]

14. Antennæ with the joints of the flagellum unusually dilated or broadened 17.

Antennæ with the joints of the flagellum slender, not broadened.

Scrobes bounded by a transverse carina superiorly; front tarsi with the basal joint depressed and broadened its entire

length; front femora dilated at extreme base beneath or with a slight tooth; middle tibiæ with a short apical spur..... Ectemnius, Dahlbom.
[Type E. guttatus, Dahlb.]

Scrobes normal, not bounded by a transverse carina superiorly.

Front femora normal, *without* a tooth beneath 15.

Front femora *with* a tooth beneath *beyond* the base or near the middle; front coxæ acute or with a tooth beneath; front tarsi depressed or subdilated; head obtrapezoidal, the temples broad and strongly convergent behind; antennæ with the third joint very long, the fourth slightly emarginate at base beneath; pygidium with a median sulcus Crabro, Fabr.

Front femora *with* a tooth or dilate angulation *at base* beneath; front coxæ normal; front tarsi depressed but not very broad, nearly normal; head obtrapezoidal, but the temples not so broad or so convergent as in *Crabro;* antennæ with joints 3–6 emarginate beneath, the sixth very strongly emarginate, the third usually elongate, nearly as long as 4–5 united; mesopleura and metathorax coarsely striate; middle tibial spur present but very short..... Pseudocrabro, Ashm., n. g.
[Type C. chrysarginus.]

15. Front trochanters armed with a spine or tooth beneath, the same often clothed with hairs; metathorax alveolate.

Front tarsi normal, cylindrical; middle tibiæ with an apical spur; antennæ simple, none of the joints emarginate Hypocrabro, Ashm., n. g.
[Type C. 10-maculatus, Say.]

Front trochanters normal, unarmed; metathorax not alveolate.

Front tarsi abnormal, dilated, or at least flattened..... 16.

Front tarsi normal, not dilated.

Middle tibiæ without an apical spur; thorax sculptured as in *Solenius;* abdomen smooth, impunctate or at most sparsely, minutely or microscopically punctate.

Antennæ normal with the second joint much thickened, none of the flagellar joints emarginate beneath..... Metacrabro, Ashm., n. g.
[Type C. Kollari, Dahlb.]

Antennæ with the second joint normal, some of the flagellar joints emarginate beneath Xestocrabro, Ashm., n. g.
[Type C. 6-maculatus, Say.]

Middle tibiæ with an apical spur; antennæ with the sixth joint strongly emarginate beneath; abdomen sparsely but distinctly punctate Xylocrabro, Ashm., n. g.
[Type C. stirpicola, Pack.]

16. Antennal joints 3 and 6 emarginate, the third about as long as 4–5 united; middle tibial spur distinct; abdomen finely, minutely, but distinctly punctate Protothyreopus, Ashm., n. g.
[Type C. rufifemur, Pack.]

17. Abdomen distinctly punctate, the pygidium without a median sulcus Thyreocerus, Costa.
[Type C. crassicornis, Costa.]

North American Species.

Subfamily III.—Crabroninæ.

(5) Solenius, Lepeletier.
(1) S. cinctellus, Fox, ♀.
(2) S. interruptus, Lepel., ♀.
(3) S. bellus, Cr., ♀ ♂.
(4) S. producticollis, Pack.
(5) S. rufipes, Lep.
= excavatus, Fox.
(6) S. scaber, Lepel.
(7) S. texanus, Cr.
? S. ventralis, Cam.
(6) Thyreus, Lepel.
(7) Ectemnius, Dahlbom.
E. montanus, Cr.
E. atriceps, Cr.
E. brunneipes, Pack.
E. corrugatus, Pack.
E. parvulus, Pack.
E. pauper, Pack.
(8) Crabro, Fabricius.
(1) C. maculatus, Fabr.
singularis, Sm.
quadrangularis, Pk.
18-maculatus, Pk.
(2) C. trapezoideus, Pack.
uncertain position.
C. saxatilis, Cam.
C. Championi, Cam.
C. antiplanæ, Cam.
C. sonorensis, Cam.
C. montivagus, Cam.
C. centralis, Cam.
C. ariel, Cam.
C. vestor, Cam.
C. costariensis, Cam.
C. guerrerensis, Cam.
C. yucatensis, Cam.
C. montezuma, Cam.
(9) Hypocrabro, Ashm.
H. decemmaculatus, Say, ♀ ♂
H. Packardii, Cr., ♀.
(10) Pseudocrabro, Ashm.
(1) P. odyneroides, Cr., ♀ ♂.

(2) P. imbutus, Fox.
(3) P. chrysarginus, Lepel.
(11) Xestocrabro, Ashm.
(1) X. sexmaculatus, Say.
(2) X. trifasciatus, Say.
(3) X. paucimaculatus, Say.
(12) Xylocrabro, Ashm.
(1) X. stirpicola, Pack., ♀ ♂.
(13) Metacrabro, Ashm.
(14) Clytochrysus, Morawitz
(1) C. obscurus, Smith, ♀ ♂.
(2) C. gracilissimus, Pack.
(3) C. nigrifrons, Cr.
= *septentrionalis*, Pack.
(15) Prototothyreopus, Ashm.
(1) P. dilectus, Cr., ♀ ♂.
(2) P. bigeminus, Patt., ♀ ♂.
(3) P. rufifemur, Pack., ♀ ♂.
(4) P. villosus, Fox, ♀.
(16) Ceratocolus, Lepel. et Br.
(17) Hypothyreus, Ashm.
(18) Thyreocerus, Costa.

BOMBYX CUNEA AND SPILOSOMA CONGRUA.

BY JOHN B. SMITH, SC. D., RUTGERS COLLEGE, NEW BRUNSWICK, N. J.

The paper in the May number of The Canadian Entomologist on the above subject is very interesting, but does not, in my opinion, entirely conclude the subject. Dr. Fyles proves definitely a considerable range of variability in what he calls *congrua*, and what is without any doubt *antigone*, Strecker. It seems to be certain that there are two species having a very similar range of variation—the insect that we call the fall webworm in the larval stage, and the insect bred by Dr. Fyles. Of the variability of *cunea* there is no doubt. I had not been aware, heretofore, that *antigone* had anything like the same range.

In the matter of determining what species Walker had before him a number of factors must be considered, as we have not available for ready examination the actual specimens described. In the first place there were three examples, apparently similar, for no variations are mentioned; but all from Georgia, and there is a very considerable range of variation in size; that is, from 16 to 20 lines, or one-third of an inch in a small species.

It becomes worth while, then, to question the distribution of the two species, *antigone* and *cunea*, and we find that whereas *cunea* is a common insect throughout the Eastern United States from the Gulf up, and extending well into Canada, we have no record of the capture of *antigone* in any Southern State. I am aware that Georgia is given as a locality in my catalogue of Arctiids, but this was without better basis than the Walker record, which was inadvertently left in. In my own collection there are no Southern specimens of *antigone*, and all the specimens in

the National Museum are from points north of New Jersey. The insect is with us decidedly rare, and only isolated specimens occur. I have never in any collection here seen the banded forms which Mr. Fyles describes, and the indications are all that the insect is rather boreal than otherwise, and would hardly be expected to extend south into Georgia, except possibly as a very rare species. It becomes extremely doubtful, therefore, whether, in a general collection such as that made by Mr. Milne, three banded specimens of *antigone*, so different in size, would be represented. On the other hand, *cunea* is common in the South, and the banded form is almost as frequent at some seasons as is the white. In all the specimens of *antigone* seen by me there is very little variation in size, and they are indeed remarkably uniform. I have six examples, ranging from New York to South Dakota, and between the extremes there is no difference of four lines, while the smallest specimen exceeds considerably the sixteen lines mentioned by Mr. Walker.

Of *cunea* I have a large series, part of them bred, part captured, and among them specimens that attain twenty lines in expanse. On the other hand, I have some that are only half that size. Nearly all the Northern specimens run small; the Southern specimens, on the other hand, mostly run large.

It is also worth noting that there is considerable variation in wing form in the specimens of *cunea*, the width varying from 5 to 8 mm. in almost the same wing length. So we have in *cunea* a variable species that is known to extend well into Georgia, whose range of size equals that given by Mr. Walker, which is common, and of which three specimens might easily be picked up in general collecting.

We have, on the other hand, *antigone*, which is generally rare, which, even in the latitude of New Jersey, is taken very infrequently, in single specimens only, and in immaculate or almost immaculate forms, which becomes more common northwardly, and of which we have no records of captures in the South. Four lines, or one-third of an inch, is a considerable range of variation. None of my examples exceed and only one equals the twenty lines given by Walker, and none are less than full 17 lines. It seems to me, aside from the statements made by Mr. Butler, that the probabilities are against Walker having had three specimens of banded *antigone* before him, while it would be an easy matter for him to get that number of specimens of large, banded *cunea*. I cannot, under the circumstances, feel, therefore, that the case is entirely proved, and that we have any real justification for changing the synonymy as it now stands in the lists.

ASPIDIOTUS (TARGIONIA) HELIANTHI, SP. NOV.

BY PERCY J. PARROTT, MANHATTAN, KANSAS.

♀ scale 1.6 to 1.8 mm. in diameter, .5 to .6 mm. in altitude, circular, quite convex, roughish, a light brown with slight tinge of pink; ventral scale thick, white at centre with brown on margin, not easily separated from scale, when detached from host plant leaves but a very slight trace of white; exuviæ sublateral, often nearly marginal, orange, covered with whitish secretion.

♀ oval, deep yellow, with dark brown on margin of posterior segment, and yellowish brown about mesal lobes and region of proboscis. When boiled in caustic potash becomes transparent, with mesal lobes a yellowish brown, and region of proboscis a reddish brown.



FIG. 30.

There are three pairs of lobes; mesal large, more narrow at base, broadening posteriorly, almost contiguous at apical end and quite widely separated at base, distal end either notched so as to resemble a human molar or almost truncate and broadly rounded on outer margin; second and third pairs of lobes small, bilobed, and mere tooth-like projections. In some specimens there is a small rudimentary fourth lobe. The margin laterad of third pair of lobes very notched. The first interlobular opening broad, in some specimens equalling in width the base of mesal lobes.

Plates simple and short, projecting very little above margin. There are generally two to each incision; those of first incision the largest, the remaining apparently very rudimentary.

Spines small, one on lateral of each lobe. Anal opening quite distant from margin. Tubular glands very numerous, as will be seen in drawing.

This species was found by the writer on March 24th, 1899, on roots of a sunflower, *Helianthus annuus*, near Hackberry Glen, Wabawnsee Co., Kansas.

THE NORTH AMERICAN SPECIES OF ORPHULELLA.

BY SAMUEL H. SCUDDER, CAMBRIDGE, MASS.

By the kindness of Prof. L. Bruner I have recently been able to study specimens of the South American *Orphula pagana* Stal., the type of the genus, and so to compare its structure with that of our native species latterly referred to Orphula. By this it appears, as Mr. Bruner has pointed out to me in correspondence, and as Mr. A. P. Morse has suggested (*Psyche*, VII., 407), that our species should be referred rather to Orphulella, separated by Giglio-Tos from Orphula in 1894, though this was afterwards regarded by him as having only a subgeneric value. Orphula in the stricter sense of the term is not, so far as I know, represented in the United States. Orphulella is the most widely distributed genus of North American Tryxalinæ and the most abundant in species. Those known to Prof. J. McNeill in his recent revision of our Tryxalinæ were well separated by a table which I have here made the basis of a new one to include a considerable number of new forms. Besides describing these, I have added notes of distribution of the others, based on the collections in my hands, and given their principal synonymy.

Table of the North American species of Orphulella.

A^1. Discoidal area of basal half of female tegmina generally plainly narrowed distally, where it is nearly always occupied by a single row of cells and is plainly narrower than the ulnar area at its widest part; ulnar area of male occupied by a single row of cells, rarely (tepaneca*) partially divided into two sets by an irregular spurious vein.

b^1. Lateral carinæ of pronotum parallel or very faintly arcuate on the prozona.

c^1. Male antennæ no longer than head and pronotum together, basally depressed and apically acuminate or subacuminate.

d^1. Pronotum less obtusely angulate; prozona and metazona subequal in length; tegmina generally not surpassing the hind femora, the discoidal area in both sexes with a spurious vein running through the middle, dividing it into two sets of cells; ulnar area with a similar (♀) or interrupted (♂) spurious vein, making a similar division *tepaneca.*

*It is a little difficult to say into which division tepaneca should fall, as it is somewhat variable; by the male it falls best here; by the female under A^2.

d^2. Pronotum very obtusely angulate; prozona distinctly longer than the metazona; tegmina generally surpassing the hind femora, the discoidal area of both sexes more or less irregularly reticulate, but with no spurious vein; ulnar area with a spurious vein in the female but not in the male *compta.*

c^2. Male antennæ a little longer than head and pronotum together, of equal size throughout and nowhere flattened *decora.*

b^2. Lateral carinæ of pronotum distinctly, often greatly, divergent both in front and behind.

c^1. Anterior ulnar vein of male tegmina distally much nearer the radial than the lower ulnar vein.

d^1. Larger species. Narrowest (middle) portion of pronotal disk more than three-fourths as wide as widest (posterior) portion *obliquata.*

d^2. Smaller species. Narrowest (middle) portion of pronotal disk not more, generally less, than three-fourths as wide as the widest (posterior) portion.

e^1. More or less variegated, the tegmina usually with a median series of spots; male antennæ no longer than head and pronotum together; hind margin of pronotum obtusely angulate.

f^1. Fastigium of vertex less sharply angulate and less prominent, in the male advanced beyond the eyes by not more than a third the length of the eye as seen from above, in the female generally rounded obtusangulate *picturata.*

f^2. Fastigium of vertex more sharply angulate and more prominent, in the male advanced beyond the eyes by half or nearly half the length of the eye as seen from above, in the female generally distinctly rectangulate *affinis.*

e^2. Rarely variegated, the tegmina usually immaculate; male antennæ longer than head and pronotum together; hind margin of pronotum rounded, scarcely angulate *speciosa.*

c^2. Anterior ulnar vein of male tegmina distally equidistant between the radial and lower ulnar veins *desereta.*

A^2. Discoidal area of basal half of female tegmina scarcely narrowing distally and here nearly always occupied by more than one row of cells, and little if any narrower than the ulnar area at its widest part; ulnar area of male either divided into two series of cells by a more or less

distinct spurious vein, or irregularly reticulate, never occupied throughout by a single series of cells.

b^1. Lateral carinæ of pronotum arcuate, the disk of unequal width, being narrower, often considerably narrower, in the middle than behind and generally than in front.

c^1. Antennæ of male considerable longer than head and pronotum together.

d^1. Disk of pronotum only slightly clepsydral, the lateral carinæ diverging but little or not at all in front and not greatly behind; tegmina of male generally but little if at all surpassing the hind femora..... *salina.*

d^2. Disk of pronotum considerably clepsydral, the lateral carinæ diverging noticeably both in front and behind, but especially behind; tegmina of male generally considerably surpassing the hind femora..... *pratorum.*

c^2. Antennæ of male no longer or scarcely longer than head and pronotum together.

d^1. Fastigium of vertex generally rectangulate in front; disk of pronotum distinctly clepsydral, the lateral carinæ distinctly and often considerably divergent both in front and behind; ulnar area of tegmina, even in the male, but little wider than the discoidal area..... *pelidna.*

d^2. Fastigium of vertex usually acutangulate in front; disk of pronotum feebly clepsydral, the lateral carinæ scarcely or not diverging in front and not greatly behind; ulnar area of tegmina, especially in the male, distinctly wider than the discoidal area..... *olivacea.*

b^2. Lateral carinæ of pronotum subparallel, so that the disk is of subequal width throughout.

c^1. Antennæ of female no longer or scarcely longer than the pronotum, distinctly flattened; face little oblique..... *viridescens.*

c^2. Antennæ of female distinctly longer than the pronotum, cylindrical; face considerably oblique..... *Scudderi.*

Having seen no specimens of *O. orizabæ* McNeill, I am unable to give it a place in the table, but it will fall in the close vicinity of *O. tepaneca.*

ORPHULELLA TEPANECA.

Stenobothrus (Rhammatocerus) tepanecus Sauss., Rev. Mag. Zool., 1861, 319 (1861).

Stenobothrus tepanecus Walk., Cat. Derm. Salt. Brit. Mus., IV., 756 (1870).

Specimens in my collection come from Corpus Christi Bay, Tex., Dec., Palmer; Mexico, Sumichrast, Botteri; Venis Mecas, Mex., Palmer; San Mateo del Mar, Tehuantepec, Sumichrast; Guatemala, Van Patten; and Realejo, Nicaragua, McNeil.

The species described by McNeill under the name *Orphula tepanica*, and doubtfully referred by him to Saussure's species, belongs, I think, to another species which I have here named *Orphulella affinis*.

ORPHULELLA COMPTA, sp. nov.

Green or dead-leaf brown, frequently with a broad dusky occipital stripe on the head, and always with a postocular fuscous stripe, more or less conspicuous, generally rather broad, straight, and cut by the lateral carinæ of the metazona. Head generally more or less flavous on the face, of medium size, the face considerably oblique; fastigium considerably depressed behind the raised margins, which are rectangulate (♀) or a little acutangulate (♂), with rounded apex, advanced in front of the eyes by less than the width between the eyes; frontal costa not very prominent, rather narrow, plane or faintly sulcate and sparsely punctate, percurrent or almost percurrent, and slightly enlarged below; lateral foveolæ faint, linear, brief; eyes moderately large, subovate; antennæ as long as (♂) or slightly shorter than (♀) the head and pronotum together, luteo-testaceous, the post-basal joints depressed but not broadened. Pronotum rather short, obtusely angulate behind, the prozona distinctly longer than the metazona, the lateral carinæ almost parallel on the prozona, considerably divergent on the metazona, luteous and noticeably dividing the postocular fuscous stripe. Tegmina generally slightly surpassing the hind femora, the discoidal area of basal half narrowed distally, more or less irregularly reticulate, but with no spurious vein; ulnar area without (♂) or with (♀) a spurious vein; median area often flecked or more or less clouded with fuscous. Hind femora considerably surpassing the abdomen, moderately slender, green or testaceous.

Length of body, ♂, 16 mm., ♀, 22 mm.; antennæ, ♂ ♀, 6.25 mm.; pronotum, ♂, 3.25 mm., ♀, 4.25 mm.; tegmina, ♂, 14 mm., ♀, 16.25 mm.; hind femora, ♂, 10.5 mm., ♀, 13.5 mm.

26 ♂, 19 ♀. Palm Springs, Cal., July 10–13; Yuma, Ariz., July 5, A. P. Morse.

Orphulella decora.

Orphula decora McNeill, Proc. Dav. Acad. Nat. Sc., VI., 239–240, pl. 4, fig. 17d (1897).

I have specimens which I refer to this species taken by Belfrage in Bosque Co., Tex., and by myself at Pueblo, Col. It was originally described from Arkansas.

Orphulella obliquata, sp. nov.

Green or brown, marked with fuscous. Head moderately large, flavo-testaceous with a greenish tinge, often green or brownish testaceous above, with a broad postocular fuscous or greenish fuscous stripe, deepest in colour above; vertex well arched, the fastigium rectangulate (♂) or obtusangulate (♀) in front, with raised margins, before which the surface is depressed; lateral foveolæ faint, linear; face arcuate, not very strongly retreating; frontal costa percurrent, rather narrow, faintly enlarging from apex to base, plane or in the female sometimes faintly sulcate; eyes moderate; antennæ castaneous, sometimes apically infuscated, scarcely depressed basally, in the female shorter than head and pronotum together. Pronotum of moderate length, the hind margin very obtusangulate, the lateral carinæ usually flavous, and cutting the generally broad fuscous postocular stripe, which lies anteriorly below, posteriorly within them, gently arcuate, the disk narrowest in advance of the middle, but here fully three-fourths as wide as posteriorly. Tegmina extending about as far back as the hind femora, the discoidal area of the basal half narrowing a little distally, and in this distal portion occupied by only a single row of cells, and much narrower than the widest part of the ulnar area, the latter occupied in the male by only a single row of cells, the anterior ulnar vein distally much nearer the radial than the lower ulnar vein; median area in basal two-thirds marked interruptedly with fuscous. Hind femora surpassing the abdomen, slender, compressed, green or brown, the outer face more or less infuscated.

Length of body, ♂, 19 mm., ♀, 21.5 mm.; antennæ, ♀, 5 mm.; pronotum, ♂, 3.6 mm., ♀, 4.1 mm.; tegmina, ♂, 17 mm., ♀, 18.5 mm.; hind femora, ♀, 14 mm.

1 ♂, 6 ♀. Dallas, Tex., Boll.; Fort Collins, Col., Baker.

ORPHULELLA PICTURATA, sp. nov.

Green or brown, marked with fuscous. Head of moderate size, lighter coloured below than above, with or without a generally slender postocular fuscous stripe; vertex gently arched, the fastigium depressed behind the raised margins, which are rectangulate (♂) or feebly obtusangulate (♀) in front, the fastigium not advanced beyond the eyes by more than a third the length of the eyes as seen from above; lateral foveolæ obsolete; frontal costa percurrent, narrow above, regularly enlarging to twice the width below, sparsely punctate, plane; eyes moderate; antennæ luteo-castaneous, apically infuscated, in both sexes much shorter than head and pronotum together, feebly depressed basally. Pronotum rather short, the hind margin obtusely angulate, the lateral lobes generally much infuscated, and obscurely and rather irregularly pictured, often with a slender fuscous stripe next the lateral carinæ, below them on the prozona, within them on the metazona, the carinæ somewhat arcuate, diverging posteriorly more than anteriorly, and the disk at its narrowest less than three-fourths as wide as posteriorly. Tegmina green or brown, usually with a median series of more or less confluent fuscous maculations, the discoidal area of the basal half of the tegmina narrowing a little distally in the female, and here occupied by one or sometimes partially by two rows of cells, narrower than the widest part of the ulnar area, the latter occupied in the male by a single row of cells, the anterior ulnar vein very much nearer the radial than the lower ulnar vein. Hind femora extending about as far as the tegmina, and, at least in the male, well beyond the abdomen, slender, compressed, green or brownish testaceous, more or less infuscated.

Length of body, ♂, 15.5 mm., ♀, 21 mm.; antennæ, ♂, 4.6 mm., ♀, 5.5 mm.; pronotum, ♂, 3.1 mm., ♀, 3.5 mm.; tegmina, ♂, 11.5 mm., ♀, 16 mm.; hind femora, ♂, 9 mm., ♀, 13.25 mm.

18 ♂, 20 ♀. Dallas, Tex., Boll.; Texas, Belfrage. Mr. A. P. Morse also took this species June 25th, by the railway in Texas, at Rosenburg, Walden, Pierson, Eagle Lake, and Flatonia.

ORPHULELLA AFFINIS, sp. nov.

? *Orphula tepanica* McNeill (nec *tepaneca* Sauss.), Proc. Dav. Acad. Nat. Sc., VI., 242–243, pl. 4, fig. 17a (1897).

Brown, rarely green, with the usual markings of the genus, the broad occipital dusky stripe generally darker at the margins, the fuscous postocular stripe cut on the metazona by the luteous lateral carinæ. Head of moderate size, the face considerably oblique, the fastigium advanced beyond the eyes in the male by half or nearly half the length of the eyes as seen from above, acutangulate in the male, rectangulate in the female, in both much depressed behind the strongly raised margins; frontal costa narrow, sulcate, enlarging below the ocellus, sparsely punctate; lateral foveolæ obsolete; eyes normal; antennæ slightly (♂) or much (♀) shorter than head and pronotum together, castaneous, apically infuscated, the post-basal joints depressed but not broadened. Pronotum not very long, the hind margin obtusely angulate, the prozona faintly longer than the metazona, the lateral carinæ divergent both in front and behind, and the narrowest part of the disk thus limited not more than three-fourths as wide as the posterior portion. Tegmina generally surpassed a little by the hind femora, the median area usually maculate, the discoidal area of the basal half narrowed distally in the female, and occupied by only a single series of cells, the anterior ulnar vein of male distally much nearer the radial than the lower ulnar vein, the ulnar area occupied by a single series of cells. Hind femora considerably surpassing the abdomen, the hind tibiæ dull luteous, with a very obscure pallid postgenicular annulus.

Length of body, ♂, 17 mm., ♀, 24 mm.; antennæ, ♂, 5.75 mm., ♀, 5 mm.; pronotum, ♂, 3.5 mm., ♀, 4.5 mm.; tegmina, ♂, 12 mm, ♀, 17 mm.; hind femora, ♂, 10.5 mm., ♀, 13.5 mm.

19 ♂, 23 ♀. San Diego, Cal., July 22; Coronado, Cal., July 2[illegible], and Kern City, Cal., Aug. 4, A. P. Morse; Colorado Desert, Cal., Aug. 13, Mus. Stanf. Univ.

ORPHULELLA SPECIOSA.

Stenobothrus speciosus Scudd.!, Bost. Journ. Nat. Hist., VII., 458 (1862).

Orphula speciosa McNeill, Proc. Dav. Acad. Nat. Sc., VI., 240–242, pl. 4, fig. 17c (1879).

Stenobothrus aequalis Scudd.!, Bost. Journ. Nat. Hist., VII., 459–460 (1862).

Stenobothrus bilineatus Scudd.!, Ibid., VII., 460–461 (1862).

Stenobothrus gracilis Scudd.!, Rep. U. S. Geol. Surv. Nebr., 250 (1871).

I have before me a series of specimens from Halifax, N. S., Piers; Moosehead Lake, Scudder; Norway, Smith; Mt. Desert, Scudder, and Brunswick, Me., Packard; the White Mt. Valleys and Hampton, N. H., Scudder; Brandon, Vt., Scudder; Summit of Graylock, Boston, Cape Cod and Nantucket, Scudder, and Blue Hills, Henshaw, and Wellesley, Mass., Morse; Farmington, Norton, and Thompson, Conn., Morse; Minnesota; Colona, McNeill and Ogle Co., Ill., Allen; Denison, Crawford Co., Dallas Co., and Jefferson, Iowa, Allen; Nebraska, Dodge, and West Point, Bruner, and the Valley of the Platte, Nebr., Hayden; and Bosque Co., Tex., Belfrage.

Orphulella desereta, sp. nov.

Pale gray-green, the green prevailing in the female, the gray in the male, both marked with fuscous in the usual manner. Head moderately large and prominent, the face rather pallid and moderately oblique, more so in the male than in the female, marked behind the eyes with a sometimes slender, sometimes broad, postocular fuscous streak, sometimes edged above with luteous; vertex well arched, more or less sometimes very slightly infuscated, the infuscation often concentrated in a pair of longitudinal stripes; fastigium well advanced, depressed before the raised margins, which are rectangulate or slightly acutangulate (♂) or obtusangulate, the apex rounded (♀); frontal costa narrow above, broadening below the ocellus, plane or feebly sulcate near the middle; eyes moderate; antennæ a trifle longer (♂) or distinctly shorter (♀) than the head and pronotum together, luteous, apically considerably infuscated, the post-basal joints somewhat depressed. Pronotum of moderate length, broadly rounded obtusangulate behind, the lateral carinæ luteous, cutting the generally narrow postocular fuscous stripe, considerably arcuate, diverging more posteriorly than anteriorly, the disk at the narrowest about two-thirds as broad as the widest posterior part, the lateral lobes below the postocular stripe immaculate or clouded above with fuscous. Tegmina somewhat surpassing the abdomen, the median area maculate with fuscous, the discoidal area of the basal half in the female distally narrowed slightly and a trifle wider than the widest part of the ulnar area, occupied partly by a single, partly by a double row of

cells, the ulnar area of the male occupied by a single row of cells, one or two of which are sometimes divided to form part of a second row, the anterior ulnar vein running distally about midway between the radial and the lower ulnar vein. Hind femora extending about as far back as the tegmina, slender, compressed, generally immaculate, but occasionally obscurely bifasciate with fuscous.

Length of body, ♂, 18.5 mm., ♀, 24 mm.; antennæ, ♂, 7 mm., ♀, 6.5 mm.; pronotum, ♂, 3.25 mm., ♀, 4 mm.; tegmina, ♂, 14 mm., ♀, 18 mm; hind femora, ♂, 10 mm., ♀, 13.5 mm.

19 ♂, 11 ♀. Salt Lake Valley, Utah, Aug. 1–4.

Orphulella salina, sp. nov.

Green or brown, marked with fuscous. Head moderately large and prominent, the face paler than the rest and moderately oblique, the postocular fuscous stripe usually present and usually slender; vertex rarely infuscated, moderately convex, the fastigium considerably depressed behind the well elevated margins, which are rectangulate, well advanced, in the male sometimes acutangulate; lateral foveolæ obsolete; frontal costa narrow, faintly broadening below, more or less sulcate, especially in the male; eyes of medium size; antennæ somewhat longer (♂) or slightly shorter (♀) than head and pronotum together, pale testaceous, apically infuscated, slightly depressed in the basal half. Pronotum of moderate length, rounded subtruncate behind, the lateral carinæ luteous, cutting the narrow fuscous postocular stripe, gently arcuate, diverging but little, occasionally not at all in front, and but little behind. Tegmina but little if at all surpassing the hind femora, the median area especially in the female maculate with fuscous, the discoidal area of basal half not narrowed distally in the female, nor narrower than the ulnar area, and filled irregularly with a double row of cells, the ulnar area of the male with a spurious vein dividing it through at least most of its course so as to form a double row of cells. Hind femora reaching (♀) or surpassing (♂ ♀) the abdomen, only moderately slender and compressed, immaculate.

Length of body, ♂, 16 mm., ♀, 23 mm.; antennæ, ♂, 5 75 mm., ♀, 6.5 mm.; pronotum, ♂, 2.75 mm., ♀, 4 mm.; tegmina, ♂, 14 mm., ♀, 18 mm.; hind femora, ♂, 9.5 mm., ♀, 11.75 mm.

7 ♂, 17 ♀. White River, Col., at Utah boundary, July 24 to Aug.

13 ; Provo, Utah, Aug. 23–24 ; Salt Lake, Utah, Packard ; Spring Lake Villa, Utah Co., Utah, Aug. 1–4, Palmer.

ORPHULELLA PRATORUM, sp. nov.

Green or brown, generally the latter, marked variably with fuscous, but generally with a broad and distinct blackish fuscous postocular stripe on head and pronotum, cut on the latter by the luteous lateral carinæ ; head occasionally with a pair of vertical fuscous stripes, enclosing a median testaceous stripe, in which case the disk of the pronotum and anal area of the tegmina are also testaceous. Head rather large and prominent, the face not very oblique ; fastigium well advanced, considerably depressed behind the well elevated margins, which are rectangulate (♂) or obtusangulate (♀) in front ; lateral foveolæ obscure, sublinear ; frontal costa much compressed and narrowed above, gently enlarging below, feebly sulcate ; eyes rather large ; antennæ somewhat longer (♂) or a little shorter (♀) than the head and pronotum together, testaceous, apically a little infuscated, the post-basal joints feebly depressed. Pronotum rather long, subtruncate but obtusangulate behind, the lateral carinæ arcuate, diverging considerably both in front and behind, but especially behind. Tegmina, at least in the male, generally considerably surpassing the hind femora, the median area often maculate with fuscous, the discoidal area of basal half of female tegmina not narrowed distally nor narrower than the ulnar area, irregularly reticulate with more than a single row of cells ; ulnar area of male with a distinct spurious vein dividing it so as to form a double row of cells. Hind femora surpassing the abdomen, moderately slender, often clouded with fuscous, the hind tibiæ often with a pallid postgenicular annulus.

Length of body, ♂, 21 mm., ♀, 24 mm.; antennæ, ♂, 7.5 mm., ♀, 7.4 mm.; pronotum, ♂, 4 mm., ♀, 4.5 mm.; tegmina, ♂, 18 mm., ♀, 20 mm.; hind femora, ♂, 12 mm., ♀, 14.5 mm.

43 ♂, 48 ♀. Maryland, Uhler; Carolina, Schaum ; North Carolina, Uhler ; Smithville, N. C., Nov. 22, Maynard ; South Carolina ; Georgia, Morrison ; Lakin, Kans., Sept. 1, Scudder ; Canon City, Col.; Texas, Belfrage ; Bosque Co., Tex., Oct. 15, Belfrage ; Dallas, Tex., Boll.; Gulf Coast of Texas, Aaron.

Specimens from the Eastern United States are generally smaller than those from the West.

ORPHULELLA PELIDNA.

Gomphocerus pelidnus Burm. !, Handb. Ent., II., 650 (1838).

Stenobothrus pelidnus Thom., Rep. U. S. Geol. Surv. Terr., V., 95 (1873).

Orphula pelidna McNeill, Proc. Dav. Acad. Nat. Sc, VI., 235–239 (1897).

Stenobothrus maculipennis Scudd. !, Bost. Journ. Nat. Hist., VII., 458–459 (1862).

Stenobothrus propinquans Scudd. !, Ibid., VII., 461 (1862).

Specimens before me come from Boston, Blue Hills, Provincetown, Cape Cod and Nantucket, Mass.; Stamford, Conn., Morse; Staten Island, Davis, and Long Island; Minnesota; Fort Collins, Col., Baker; Capron and Fort Reed, Comstock, Appalachicola, Thaxter, Sandford, Frazer, Charlotte Harbor and Biscayne Bay, Mrs. Slosson, and Key West, Fla., Morrison, Palmer; La Firmina, Cuba, Wright; and the Isle of Pines, Scudder; Atmore, Ala., Morse; Mesilla, N. Mex., June 29, Morse; and Colton, July 17, Los Angeles, July 26, and Gazelle, Cal., Sept. 4, Morse.

ORPHULELLA OLIVACEA.

Stenobothrus olivaceus Morse. !, Psyche, VI., 477–478, figs. 1, 2 (1893).

Orphula olivacea Morse, Ibid., VII., 327, 411, pl. 7, figs. 10, 10a (1896); McNeill, Proc. Dav. Acad. Nat. Sc., VI., 239, pl. 4, fig. 17b (1897).

Orphula (Orphulella) olivacea Gigl.-Tos., Boll. Mus. Zool. Tor., XII., No. 301, 2 (1897).

Mr. Morse has given me specimens taken by him at Stamford and Norwich, Conn., and I have others from Maryland, Uhler, and Georgia, Morrison, besides a number taken by C. M. Weed on Bermuda. Giglio-Tos reports it from Panama and Venezuela.

ORPHULELLA VIRIDESCENS, sp. nov.

Green throughout, the head more or less flavescent, the disk of the metazona somewhat feebly infuscated, and the upper part of the lateral lobes bordering the carinæ with a slender purplish fuscous stripe extending to the eye. Head moderately large, the face only a little oblique; fastigium a little depressed within the rectangulate margin; frontal costa moderately prominent, plane and delicately punctate, narrowed above,

very gradually enlarging to the ocellus, below which it is subobsolete; lateral foveolæ wanting; eyes moderate, subpyriform; antennæ about as long as the pronotum, with the post-basal joints distinctly depressed. Pronotum rather short, feebly rounded in front, slightly rotundato-angulate behind, the lateral carinæ subparallel, faintly sinuate, the disk narrowest behind the middle of the prozona, which is barely longer than the metazona. Tegmina barely surpassing the hind femora, the discoidal area scarcely narrowing distally and scarcely narrower than the widest part of the ulnar area, rather densely reticulate proximally, with two rows of irregular cells distally; wings with the veins of the anterior area more or less roseate. Hind femora as long as the abdomen, not very slender, green, feebly ferruginous beneath.

Length of body, 20 mm.; pronotum, 4 mm.; tegmina, 15.5 mm.; hind femora, 13 mm.

1 ♀. Mt. Alvarez, Mexico, E. Palmer.

ORPHULELLA SCUDDERI.

Ophula Scudderi Bol., Mém. Soc. Zool. France, I., 142 (1888).

I have specimens taken at La Firmina, near Bemba, Cuba, by Wright, and on the Isle of Pines by myself.

ERRATUM.

Page 121 (C. E., May, 1899), near the bottom, for "Eudeopsylla" and "*Eudeopsylla nigra*," read "Udeopsylla" and "*Udeopsylla nigra*."

SOME NEW SPECIES OF DELTOCEPHALUS.

BY E. D. BALL, FORT COLLINS, COLO.

DELTOCEPHALUS AREOLATUS, n. sp.

Resembling *imputans*, Osb. & Ball, but with a much longer vertex; vertex longer than in *producta*, Walk. Olive green, a spot on the middle and another at the tip of each elytron and all below black. Length, ♀, 4 mm.; ♂, 3.5 mm.; width, 1.75 mm.

Vertex flat, strongly acutely angled, the tip rounding, almost twice as long as the pronotum, fully twice longer than width between eyes, margin sharp, angle with the face acute; front depressed, almost as much above the ocelli as below, lateral margins straight, continuous with those of the clypeus; loræ small, two-thirds the width of the clypeus; pronotum

over twice wider than long — half the length within the anterior curve; elytra flaring, venation of the reflex-veined type, the second cross nervure wanting.

Colour: vertex yellowish olive, the tip ivory white, margined with black, pronotum olive, the anterior third yellowish, elytra pale olive, a large fuscous blotch back of the cross nervure between the sectors, and another on the margin of the third apical cell, reflexed veinlets white, margined anteriorly with fuscous, all below, except tarsi and part of the genitalia, black.

Genitalia: female, ultimate ventral segment twice the length of the penultimate, lateral margins strongly narrowing posteriorly, posterior margin angularly excavated one-third the depth of the segment, with a rounding medially cleft tooth equalling the lateral angles; male, valve triangular, the apex produced, plates narrow at base, nearly twice longer than valve, narrowing towards the blunt, angularly divergent apices.

Described from one female from Arizona (Kunze), one from College Park, Md. (Johnson), and one male from Md. (Heideman). This is another of the reflex-veined group, and would fall between *producta* and *imputans;* from the former it is readily separated by its colour, and from the latter by the much longer vertex.

DELTOCEPHALUS FLEXULOSUS, n. sp.

Form of *reflexus* nearly with narrower vertex and elytra, resembling *abbreviatus* in colour and ornamentation. Light cinereous, with the margins of the nervures and the markings on the vertex fuscous; face black above, white below. Length, ♀ 4 mm., ♂ 3.5 mm., width 1.25 mm.

Vertex one-third longer than pronotum, nearly that much longer than its basal width, disc flat, the margins sharp; face as in *reflexus;* pronotum distinctly narrower than the eyes, twice wider than long; elytra longer, narrower than in *inflatus*, with a similar venation, veins on clavus separate or only connected by a cross nervure.

Colour: light cinereous washed with pale yellow, traces of pale olive or fuscous lines on the pronotum; margins and tip of vertex ivory white, an orange line just inside the margin and a fuscous circle around tip; elytra pale, the nervures creamy white with narrow fuscous margins, a fuscous spot either side the cross nervure on the clavus, and a larger pair next the first cross nervure on the corium, the apical margin and the anterior margins of the reflexed veinlets fuscous; upper half of face shin-

ing black, with traces of four light arcs, lower half light lemon-yellow.

Genitalia: female, ultimate ventral segment resembling *abbreviatus*, twice longer than penultimate, lateral margins narrowing posteriorly, posterior margin angularly emarginate, a broad wedge-shaped median tooth extending beyond the lateral angles, the apex slightly notched in the middle and arcuated either side; male, valve broad, triangular, plates narrow convex, half longer than valve; pygofers longer than plates, compressed ventrally, forming a blade-like structure, for the reception of which the plates are notched half way to the base.

Described from numerous specimens taken at Fort Collins, Colo., and back into the mountains to the Little Beaver (9,500 feet), also specimens from Windsor, Estes Park, Denver and Holly in Colo., and from Western Kansas. The black on the upper half of the face will serve to separate it from all but *reflexus* and the following species, and from these it may be distinguished by the flat pygofers and the notched plates.

DELTOCEPHALUS STYLATUS, n. sp.

Similar in form and colour to *flexulosus*, but broader, as broad as *inflatus*, with the black on the face and the flaring elytra of *reflexus*. Length 4.5 mm., width 1.75 mm.

Vertex one-third longer than pronotum, little longer than its basal width; width across eyes equal to the combined length of pronotum and vertex; front and clypeus proportionally broader than in *flexulosus*; elytra longer than abdomen in most specimens; venation as in *inflatus*, the basal angle of the third apical cell a right angle, claval nervures separate.

Colour: pale cinereous, vertex greenish, markings on margin and tip as in *flexulosus*, a transverse band on either side before eye and a spot in the middle of either side at the base fuscous; pronotum with a submarginal row of fuscous spots; elytra pale, with dark margined nervures and fuscous markings as in *flexulosus*.

Genitalia: female, ultimate ventral segment over two and one-half times as long as penultimate, lateral margins nearly parallel, posterior margin straight, produced on the middle third into an obtusely triangular tooth, which is bifid at the apex and bears a small lateral tooth at about the middle of either side; male, valve equilaterally triangular, plates narrow, extending beyond the valve scarcely its length, roundingly divergent at the apex, where they are half as wide as at the base, their tips roundingly emarginate, pygofers inflated, extending considerably

beyond the plates, their inner margins extending into a pair of narrow, curved, black, style-like processes.

Described from five males and five females swept from prairie grass at Little Rock, Iowa, by the author.

DELTOCEPHALUS MISSELLUS, n. sp.

Form and general appearance of *Sayi*, but smaller and lighter coloured, resembling the European *picturatus* and *flori*, but readily separated by the genitalia. Length 2.75–3 mm., width 1 mm.

Vertex flat, right angled before, its length and basal width equal, one-third longer on middle than against eye, slightly longer than pronotum; face as in *Sayi*, the front narrow, wedge-shaped, the lateral margins continuous with those of the clypeus; pronotum over twice wider than long; elytra broad and short, broadly rounding behind, the apical cells little longer than their apical width; elytra shorter than the abdomen in the female, longer in the male.

Colour: pale cinereous washed with yellowish brown, the anterior half of the vertex, except the lateral margin, brownish fuscous, divided into four quadrants by a light cross, the anterior pair darkest on the oblique margins; pronotum irregularly marked with fuscous; elytra pale cinereous, the nervures whitish, irregularly margined with fuscous, the white emphasized on all the transverse nervures; face olive fuscous, short arcs on the front, a median line on the lower half, a spot on the loræ and the margins of the clypeus and genæ light; below fuscous, legs light, anterior femora annulate.

Genitalia: female, ultimate ventral segment half longer than penultimate, the posterior margin slightly, roundingly produced in the middle half, the apex nearly truncate; male valve obtusely triangular, plates broad at base, rapidly narrowing to the acute slightly divergent points, not quite half longer than the valve, concealing the pygofers.

Described from numerous specimens taken between Rist Canon (6,000 feet) and the head waters of the Little Beaver (9,500 feet), one specimen from each, Estes Park, Pinewood and Steamboat Springs, and several from Marshall's Pass, all points being in the mountains of Colo.

DELTOCEPHALUS VINCULATUS, n. sp.

Form and structure of *signatifrons* nearly, broader and more distinctly marked. Pale cinereous marked with rust brown and fuscous; two broad, transverse fuscous bands on the pale elytra. Length, ♀ 3.5 mm., ♂ 3 mm.; width 1.75 mm.

Vertex flat, slightly obtusely angled, one-third wider than the middle length, over three-fourths the length of the pronotum, face and facial angle as in *signatifrons;* pronotum shorter, over twice wider than long; elytra equalling the abdomen in the female, slightly longer in the male, shorter than in *signatifrons*, with a very slight appendix, venation as in *cruciatus.*

Colour: vertex with the margins, a median stripe and a short transverse bar before the middle always light, the remainder of the disc with a very variable amount of fuscous, fading out posteriorly into a rust brown; pronotum irregularly marked with rust brown—in the darker specimens arranged in longitudinal stripes; elytra pale, subhyaline, the nervures white, a broad, slightly oblique band across the middle, another before the tip, and spots on the margins of the second and third apical cells fuscous.

Genitalia: female, ultimate ventral segment short, the lateral angles acute, posterior margin roundingly emarginate either side of a large, acutely pointed, black tooth, which is cleft nearly to its base; either side of this tooth the oblique finger-like plates are exposed; male valve obtusely angulate, longer than the ultimate segment, plates broad at base, slightly narrowing to the truncate tips, where they are two-thirds the basal width, two and one-half times the length of the valve, set obliquely together, forming a trough.

Described from numerous specimens swept from the meadows of the Little Beaver, in the mountains west of Fort Collins, Colo.

CTENUCHA CRESSONANA.

In the recent volume published by the British Museum (Natural History), Sir Geo. Hampson refers this species, described by me in 1863, as the same with *C. venosa.* The material in the British Museum from North America: Texas, Grote and Zeller collections, is all *C. venosa. C. Cressonana*, from Colorado, is clearly distinct, a larger species more of the type of *C. virginica*, and I can only suppose that unacquaintance with my type has led to the present lumping. I may also add, that it can hardly be settled in the British Museum, whether the Californian *Scepsis Packardi*, which has lighter tinted primaries, and greater extension of a paler yellow on the head, be a local race of *S. fulvicollis* or not. From analogy in the group, it will probably prove distinct.

Roemer Museum, Hildesheim, Germany. A. Radcliffe Grote.

A NEW COSSONUS.

BY ANNIE TRUMBULL SLOSSON.

In the CANADIAN ENTOMOLOGIST (Vol. XXVII., p. 322), the late Dr. John Hamilton, in an interesting article on the Coleoptera of Lake Worth, Florida, referred to a new species of Cossonus found there. He speaks of taking, under the bark of a dead limb of the Rubber tree (*Ficus aurea*), five examples of a new Cossonus, with basal half of the elytra, metasternum and abdomen rufous. He gives no other description nor does he name the beetle.

In March of the present year, at Miami, on Biscayne Bay, Florida, I found several specimens of what is evidently the same species referred to by Dr. Hamilton. They were under the bark of a fallen and dead Rubber tree. It seems proper and befitting that Dr. Hamilton's name should be associated with this bettle, and I have ventured to describe it below under the specific name of *Hamiltoni*. I trust it will not be considered out of place here for me to speak of my affection, respect and admiration for the good Doctor. We never met face to face, but we corresponded for several years, and he gave me great assistance in my studies among insects. His letters were marked by unfailing courtesy and kindliness, gratitude for even the smallest favour from me, appreciation of the most unimportant discovery I might make. As do many others, I remember him and miss him continually.

Cossonus Hamiltoni, n. sp.—Black, shining, with basal half of elytra, the metasternum and abdomen rufous; antennæ and legs dark red. Rostrum stout, finely and closely punctulate, very abruptly and almost transversely-quadrangularly dilated at apex, the dilated portion barely as long as the basal portion.

Thorax oblong, with a triangular depression extending from base to near apex and having a feebly indicated and sometimes slightly elevated median line. The punctures in this depression are coarse and irregular, on sides of thorax smaller and more regular. Elytra slightly wider than base of thorax, surface rather deeply striate at base; striæ with close, deep punctures, but not impressed at apical portion. Prosternum very coarsely and somewhat densely punctate; mesosternum more sparsely punctured; as are also the metasternum and first two abdominal segments.

Length—exclusive of rostrum—2.9–4 mm.

Locality: Miami, Biscayne Bay, Fla.

CORRESPONDENCE.

LEUCOBREPHOS MIDDENDORFI.

When I was the other day looking over some of the back numbers of the CANADIAN ENTOMOLOGIST I came across an account of the taking of *Leucobrephos Middendorfi*, Men., by Mr. Hanham, of Winnipeg. I believe that this species is not generally to be found in collections. Here I cannot call it uncommon. I see, on an average, quite half a dozen specimens every spring, but the moth, from its habits, is most difficult to capture. It appears with the first warm days of spring, flying in the sunshine, low down amongst the stems of short scrub, generally that in which the black cherry predominates, and over banks of melting snow, the remains of drifts, a situation in which it is impossible to use a net, and all one can do is to look at and long for it. When it does venture out into the open its colour so coincides with the prevailing grayness of its surroundings, and renders it so inconspicuous, that, with the addition of its erratic flight, it is most difficult to net. I have only taken two, and I should be sorry to say how many I have missed, and I am not a "bad shot" on the whole. It is always turning up, too, at unexpected and inconvenient times. This spring I walked about one warm day, April 13th, till I was tired without getting a chance. Shortly after I had given the moth up, hearing a commotion among my poultry, I ran down to the stables with my gun. The hawk did not wait for me, but I saw Middendorfi flying very quietly about a heap of manure outside the door of one of my stables, where he could have been easily netted had I but been prepared. My house, stables, etc., are surrounded by scrub of various sorts. E. FIRMSTONE HEATH, Cartwright, Man.

THE TOBACCO FLEA-BEETLE *(Epitrix parvula)* ATTACKING TOBACCO IN BARN.

In Dr. Howard's excellent treatise on this beetle in the Yearbook of the United States Department of Agriculture for 1898, pp. 123–5, no mention is made of the depredations of the insect in tobacco after it has been gathered and hung in the tobacco barn. Last year, in Southern Ohio, these beetles were found to have worked serious injury to tobacco in the fields, especially to the lower leaves. In these fields the beetles ate holes in the larger leaves, and when the leaf was not eaten through the remaining tissue, when dry, would break up and disappear, thus

leaving holes. It seems that while the tobacco is cut and piled in the fields, awaiting transportation to the tobacco barn, the beetles collect among the leaves, remain there, and are removed with the tobacco. After the tobacco is hung up to cure in the barn the beetles continue their attack on the younger and more succulent *upper leaves* (the lower when hung up), and by eating these, especially along the midrib, do even more injury than in the fields, as this last attack not only causes holes in leaves not previously injured, but discolours them also. Between the two attacks the damage is very serious. F. M. Webster.

The Entomological Society of Albany has recently been organized, with an initial membership of about twenty, under the following officers: Dr. E. P. Felt, President; Prof. Charles S. Gager, Vice-President; Mr. Charles S. Banks, Rec. Sec.; Miss Margaret F. Boynton, Corr. Sec.; Prof. H. M. Pollock, Treas. The headquarters of the society will be, for the present, at the office of Dr. Felt, the State Entomologist, where the regular meetings will be held the second Friday of each month. The objects of the society are the promotion of interest in entomological science and the furtherance of fellowship among those interested for their mutual benefit and enjoyment.

Sir,—In your May issue Mr. Lyman reviewed my Synonymic Catalogue of North American Butterflies. There is one point he mentions which deserves explanation. He says: "In this catalogue Dr. Skinner has followed very closely on the lines laid down by Mr. Edwards in his lists, so far as the species are concerned, and with a conservatism which is striking when compared with his rather sweeping radicalism as expressed in his article, 'Impressions received from a Study of our North American Rhopalocera,' in Jour. N. Y. Ent. Soc., IV., 107." Prof. Cockerell, in Science, IX., No. 219, expresses himself in the same way, and says: "There is no tendency to 'lumping' exhibited, which is rather surprising in consideration of some of Dr. Skinner's previously expressed views." I did not think a catalogue the proper place to introduce into the synonymy what have been previously recognized as valid species. No reasons could be given for such changes in a list of names, and if I had "lumped" species they would have represented nothing but the bare opinion of one individual. The proper place to make such changes is in monographs and revisions, where the reasons therefor may

be fully and accurately stated. Where changes were made in the synonymy, in the catalogue, they represented published views on the subject, often expressed by a number of authors. Mr. Lyman himself covers the ground fairly well in the 29th Rept. Ent. Soc. Ont., p. 18, where he says: "In entomology, as no doubt in other branches of natural science, some men are lumpers and others splitters. To the latter I would say that the describing of new species should certainly not be done on the chance of their proving distinct, and to the former that once a form has been described as a new species IT SHOULD NOT BE LUMPED EXCEPT UPON OVERWHELMING PROOF." I may state that I still think quite a number of the names listed in the catalogue will prove synonyms, but we need proof, or opinions based on proof, with the REASONS set forth to prove the case.

HENRY SKINNER, Philadelphia.

NOTE BY MR. LYMAN.—Dr. Skinner is no doubt correct in his view that a cataloguer should not be a lumper, but at the same time it is, I think, usually expected that a catalogue should reflect in some degree the more conservative views of its compiler.

Under *Chionobas Tarpeia* Dr. Skinner very properly explains that there is considerable doubt of the species having ever been taken in North America, and if the species of Argynnis of the Eurynome group had been followed by a note to the effect that their distinctness was open to considerable doubt, no one could have objected, and such a note would tend to attract more attention to the study of these interesting forms. But Dr. Skinner went much further in the case of the Pacific Coast forms of Chionobas in lumping *Gigas*, Butl., *Californica*, Bdl., and *Iduna*, Edw., under *Nevadensis*, Felder.

No monographic work had been done in this case except by Edwards, who maintains the distinctness of the forms. Elwes had "revised" *Oeneis*, but in the case of these species had added nothing to what was already known about them. H. H. L.

MR. R. A. COOLEY, assistant to Prof. Fernald in the Insectary of the Massachusetts Agricultural College, has received the appointment of Professor of Zoology and Entomology in the Montana State College at Bozeman, Mont. Mr. Cooley has just completed a monograph of the genus *Chionaspis*, which will shortly be published.

Mailed July 6th, 1899.

The Canadian Entomologist.

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A LIST OF MANITOBA MOTHS.—Part III.

BY A. W. HANHAM, WINNIPEG, MAN.

The Noctuids of this Province, as already known, make a very fair list, and include a number of rare moths, as well as a good percentage of new species. I have seen all Mr. E. F. Heath's things, and his additions to my list are quite numerous ; these appear as taken at Cartwright. The Rounthwaite records are Mr. L. E. Marmont's (I have seen his collection), and he has added some rare species. The Brandon records are in some cases my own, as I have visited there the last three summers ; others are Mr. H. W. O. Boger's, of that place. I have seen paintings of a number of moths collected at the Douglas swamp by Mr. Criddle, of St. Alban's, Aweme, and these have given me a few extra names.

My best collecting here has been done at light, at Brandon off bloom on the prairies, and I have also had very fair success, both here and at Brandon, from sugaring late in the season (from the middle of August until early in October).

A very large proportion of the species listed have been referred to Prof. John B. Smith, who has been untiring in his efforts to help me, and without whose kind assistance this list would have been impossible, or very incomplete. A few things, still doubtful, remain in his hands for future determination. Others, that would have increased my list, came to grief in the mails. These species, it is hoped, will be taken again during the coming season.

Thyatira scripta, Gosse. Cartwright.

Euthyatira pudens, Gn. Rounthwaite ; one at black currant bloom early in May.

Pseudothyatira cymatophoroides, Gn. Common at light, end of June and early in July (1897); also netted at dusk flying along the edge of the woods close to my house.

Pseudothyatira expultrix, Grt. One only, at light, beginning of July.

Leptina latebricola, Grt. Cartwright.

Panthea acronyctoides, Walk. July 12th ; one at light.

Raphia frater, Grt. June 17th to July 13th; very common at light, both in 1897 and 1898. In 1895 (June 30th), I got a pair by beating. One of my specimens is very richly suffused with black on primaries.

Charadra deridens, Gn. June 27th (1897); one at light.

Diphthera fallax, H.-S. June 17th, 24th, etc.; rather rare at light.

Arsilonche albovenosa, Goetze (Henrici, Grt.). Cartwright.

Acronycta Americana, Harr. Have taken the pupæ of this species plentifully in the spring and fall, attached to the under side of boards and logs in woods, but I have never taken more than one at light (July 8th).

Acronycta hesperida, Smith. One at light, about the middle of July (1897).

Acronycta dactylina, Grote. Several at light, early in July.

" lepusculina, Gn. Brandon and Rounthwaite.

" innotata, Gn. July 13th (1898); one at light.

" morula, G. & R. June 21st (1894); one at rest on fence.

" furcifera, Gn. June 3rd (1896); one at rest on tree in Elm Park.

" hasta, Gn. Cartwright.

" Manitoba, Smith. One specimen only.

" quadrata, Grote. Cartwright and Douglas.

" revellata, Smith. At light, June 19th, and several early in July.

" grisea, Walk. Cartwright.

" falcula, Grote. June 24th, one at light; also from Cartwright.

" parallela, Grote. June 21st (1896), one at rest in the city.

" ovata, Grote. Cartwright, and one here at light.

Acronycta hamamelis, Gn. Not uncommon at light; June 18 until middle of July.

Acronycta luteicoma, G. & R. June 10th (1894), one at rest on tree in woods near St. Boniface.

Acronycta sperata, Grote. Cartwright.

" noctivaga, Grote. Brandon.

" emaculata, Smith. At light, May 13th, etc.

Acronycta impressa, Walk. At light, May 13th to 22nd (Winnipeg), and again middle to end of July (Brandon). These two species were confused until recently, and I cannot speak with certainty as to number taken.

Acronycta oblinita, S. & A. Rare at light, June 22nd, etc.

" lanceolaria, Grote. Rounthwaite. A rare and early species.

Micrococlia fragilis, Gn. Rare at light, end of June.

" diphtheroides, Gn. Rare at light, end of June and July 1st.

Bryophila lepidula, Grote. June 13th and 20th (1896), two at rest on fences.

Bryophila teratophora, H.-S. A pair at light early in July (1897).

Chytonix palliatricula, Gn. At light, end of June. A number have been secured from pupæ, both here and at Quebec ; they are attached to the under side of boards, or in a similar manner to those of A. Americana, and I have found both species on the same board.

Rhynchagrotis chardinyi, Bdv. Occasional, at thistle bloom, July 15th, August 3rd, etc., and hiding at the roots of weeds ; also fairly plentiful at light, middle to end of July.

Rhynchagrotis rufipectus, Morr. Nice, fresh specimens at light, August 5th to middle of month. At Brandon, at sugar, August 21st to September 1st.

Rhynchagrotis cupida, Grt. Brandon, July 31st (1896), one at bloom ; also one here at light in 1897.

Rhynchagrotis placida, Grt. End of July, frequently at light. Brandon, at bloom July and August, and at sugar till nearly end of August.

Rhynchagrotis alternata, Grt. Common at sugar in Elm Park, middle to end of August (1896); also at Brandon in 1898. A few at light, end of July.

Adelphagrotis prasina, Fabr. Rare at light in July.

Platagrotis pressa, Grt. At light and at bloom in July.

Pachnobia littoralis, Pack. (Smith's list, 1643.) June 20th (1896), one under a log on railway bank ; also from Cartwright.

Pachnobia Fishii, Grt. (Smith's list, 1638.) May 24th, one at light.

" salicarum, Walk. Cartwright.

Agrotis perattenta, Grt. (Smith's list, 1613.) Several at light during July.

Agrotis ypsilon, Rott. August and September, common at sugar ; also at bloom and at light.

Peridroma occulta, Linn. One or two at light, July 23rd, etc.; also at Brandon and Cartwright.

Peridroma astricta, Morr. August 8th, two at light ; also at Rounthwaite.

" saucia, Hbn., and var. margaritosa, Haw.

A very variable insect. Common at light and at sugar during August and September, and taken as late as October 2nd.

Noctua Smithii, Snellen (baja ‡, Auct.). Another very variable species. Common at Winnipeg, and particularly so at Brandon; at bloom from the middle of July until towards the end of August.

Noctua Normaniana, Grt. Not nearly so common as the foregoing, but fairly plentiful at Brandon at bloom, in 1896, from middle to end of July, and taken here at light in 1897, about the same date.

Noctua bicarnea, Gn. Occasional, at light, towards end of July.

Noctua Treatii, Grt. Three specimens at light, July 2nd and later (1897); not taken last season. Prof. Smith states that it is not uncommon at Calgary.

Noctua c–nigrum, Linn. At light, middle to end of July, but not common.

" rubifera, Grt. Rare at light, beginning of July.

" rosaria, Grt. Included by authority of Prof. Smith.

Noctua cynica, Smith. A few at sugar at Brandon, August 30th and September 1st.

Noctua fennica, Tausch. Have taken this species in the house as early as June 20th. It has proved quite a nuisance, both on the Brandon prairies at bloom and here at light, during July. My latest record is August 31st (at light).

Noctua plecta, Linn. Three specimens at light on July 25th (1897), and more abundantly last season, also at light.

Noctua collaris, G. & R. Several at light at the end of July. Here and at Brandon, by sweeping Solidago, during August. (This species appears to have a decided preference for S. rigidus.)

Noctua haruspica, Grt. Both seasons this moth has been abundant at light during July, and some evenings by no means a welcome visitor for this reason. The usual form here is paler than the Eastern one.

Noctua clandestina, Harr. This species is generally very abundant under loose bark. I noticed it especially so on July 1st (1895) on fence posts. Has been taken as late as August 25th. Not a common insect at light.

Noctua atricincta, Smith. Brandon; at bloom, middle of July (1896), a pair only.

Noctua patefacta, Smith. Brandon; one at bloom towards end of July (1896).

Rhizagrotis introferens, Grt. (Smith's list, 1698.) One in July (1894), bred from the pupa; also at Cartwright.

Feltia subgothica, Steph. Very common at bloom, middle of July to end of August. Taken as late as September 23rd.

Feltia herilis, Grt. Nearly as plentiful at bloom as subgothica, and out with it. Both these species came frequently to light.

Feltia jaculifera, Gn. (tricosa, Lint.). Until a short time ago this species and herilis were both jaculifera in my collection, and the moth called herilis proves to be Carneades ochrogaster (1834). At the present time I only appear to have one specimen of jaculifera with a Brandon label, and owing to the confusion of names referred to above, I cannot speak with certainty as to its abundance here.

Feltia venerabilis, Walk. Several at light, August 31st to September 4th; also at Brandon at bloom.

Feltia robustior, Smith. Three specimens of this new species were taken altogether; the first on August 27th, off golden-rod, another on August 30th, at sugar (in a small swamp), and the third September 1st, also off golden-rod. All three in the vicinity of the Experimental Farm at Brandon.

Feltia volubilis, Grt. June 24th, one at light; also from Cartwright and Rounthwaite.

Porosagrotis murænula, G. & R. Brandon; rare at sugar, end of August.

" catenula, Grt. Brandon and Cartwright.

Porosagrotis mimallonis, Grt. Brandon; a beautiful, fresh specimen, off golden-rod, on August 27th; also from Cartwright.

Carneades quadridentata, G. & R. Brandon; at bloom, August 28th.

" niveilinea, Grt. A pair at Brandon at light, August 20th.

" Ridingsiana, Grt. Cartwright.

Carneades flavicollis, Smith. This was the most abundant species taken at Brandon, at bloom on the prairies, in 1896 (from middle to end of July), and worn examples were taken there in 1897 until the middle of August. Taken here at light, both in 1897 and 1898, but not in any numbers.

Carneades velleripennis, Grt. I took a pair here at light on September 1st, 1897; one at sugar at Brandon on August 27th, 1898, and several off heads of Solidago at Carberry on September 14th.

Carneades scandens, Riley. Rather plentiful at light for about a week (July 12th, etc., 1898).

Carneades pleuritica, Grt. Several at bloom on the prairies at Brandon towards end of July (1896).

Carneades pitychrous, Grt. At Brandon, August 14th, 1897, off golden-rod, and quite common off the same flower at Carberry on September 14th, 1898 (during the afternoon).

Carneades messoria, Harr. Brandon, at bloom, and Winnipeg, at light, towards the end of July.

Carneades incallida, Smith. Brandon and Cartwright.

Carneades dissona, Moeschl. Brandon; one on September 1st, I think, at sugar. (Prof. Smith says it was described from Labrador.)

Carneades tessellata, Harr. Common both at light and at bloom, during the latter part of July.

Carneades insulsa, Smith. Taken at light towards the end of July, and the most abundant species at Brandon, during August, at bloom on the prairies. Has been taken at sugar also. This species is extremely variable, some being almost black, while the rarest and most striking form is almost equally light coloured.

Carneades detersa, Smith. Cartwright.

" segregata, Smith. Cartwright.

Carneades basalis, Grt. One specimen only at Brandon, at bloom, in 1896, near the end of July; also seen from Beulah, Man.

Carneades ochrogaster, Gn. Very common under logs some seasons, from end of July to end of August. Fairly common here at light, and at Brandon at bloom. Sometimes on the wing during the afternoon. Some of the forms of this variable species rank among our handsomest Noctuids.

Carneades infusa, Smith. Prof. Smith, in naming my specimens, says that this new species is allied to *obeliscoides*. It was taken at Brandon on August 31st and September 1st, at sugar and at bloom; also seen from Cartwright.

Carneades divergens, Walk. Very common at light, during the early part of July, especially in 1897.

Carneades redimicula, Morr. A few at bloom at Brandon in July, 1896, and August, 1898.

Carneades tesselloides, Grt. One at light in June.

Carneades silens, Grt. Some beauties at light, from 1st July to middle of the month. At Brandon, off bloom, middle of July, 1896. An occasional specimen has none of the dark markings.

Carneades quinquelinea, Smith. "It is likely, from the material sent me by Mr. Heath, that this is merely a very sharply marked *incallida*. It should be so referred."—(J. B. S.) Cartwright.

Anytus sculptus, Grt. Not uncommon at sugar here and at Brandon, August 27th to September 5th; also a few at light early in September.

Mamestra Rogenhoferi, Moesch!. One specimen each season at light, middle of July. (According to Prof. Smith, this is a species only hitherto recorded from Labrador.)

Mamestra mystica, Smith. Occasional, at light, about the middle of July; also from Cartwright.

Mamestra purpurissata, Grt. Rather plentiful at bloom at Brandon, middle to end of July, and here at light, towards end of same month. (A rather fine species.)

Mamestra meditata, Grt. Rather common at light in July; also sometimes at bloom.

Mamestra cervina, Smith. Common at light, end of June to middle of July.

Mamestra neoterica, Smith. At light, with cervina, but not so numerous. Both these new species, together with mystica, were described by Prof. Smith in *Entomological News* (December No. of Vol. IX.).

Mamestra distincta, Hbn. Cartwright.

Mamestra Farnhami, Grt. A handsome species. Cartwright and Rounthwaite.

Mamestra atlantica, Grt. Plentiful at light, from the middle of June until nearly the end of July.

Mamestra desperata, Smith (= 1953 = radix, Wek.). A few at light, middle to end of June.

Mamestra subjuncta, G. & R. Rare at light, end of June.

" grandis, Bdv. Rare at light, end of June.

" trifolii, Rott. Rounthwaite.

Mamestra rosea, Harv. One at light, end of June. Another from Brandon (pupa found April 24th, moth evolved May 15th).

Mamestra picta, Harr. A beauty, at light, July 12th (1898).

" lubens, Grt. A few at light, end of June and early in July.

" assimilis, Morr. Several at light, first part of July.

Mamestra adjuncta, Bdv. A beautiful species when in good condition; taken in July, and appears to be rare here.

Mamestra legitima, Grt. From Cartwright and Rounthwaite. Rather an early Mamestra, and quite richly coloured when fresh.

Mamestra lilacina, Harv., and
form illabefacta, Morr. This species does not seem to be on the wing until July, but during that month, especially in 1897, it was exceedingly common at light.

Mamestra obscura, Smith. Cartwright.

Mamestra renigera, Steph. Common at light, middle to end of July, and at bloom on the prairies.

Mamestra olivacea, Morr. This species appears to be out from the middle of July to the middle of August, and is common both at light and at bloom. It shows quite a range of variation.

Mamestra incurva, Smith. Cartwright.

Mamestra lorea, Gn. A nuisance at light, especially about the beginning of July.

Mamestra quadrannulata, Morr. Rounthwaite. (This, I understand, is a good catch.)

Mamestra anguina, Grt. (var. larissa, Smith.) Brandon.
" vicina, Grt. Brandon; one at bloom in July.

Mamestra gussata, Smith. Brandon. (Described from Calgary. Quite a pretty species.)

Hadena niveivenosa, Grt. Common at light, at the end of July, and taken on the wing during the day.

Hadena stipata, Morr. August 15th; three specimens at bloom at Brandon.

Hadena passer, Gn. Several at light in 1897, about the middle of July.
" remissa, Hbn. One at light at the beginning of July.
" suffusca, Morr. (=illata, Walk.) Several at light early in July.
" finitima, Gn. End of June, one at dusk.

Hadena lateritia, Hbn. Taken under logs on July 13th, etc., at bloom, and common at light early in July.

Hadena dubitans, Walk. (=sputatrix, Grt.) As common as the preceding species, and out at the same time.

Hadena plutonia, Grt. Cartwright.
" impulsa, Gn. Two or three at light, July 15th, etc.

Hadena devastatrix, Brace. Common under logs, and at light during July, and towards the end of September have taken fresh specimens at sugar and at light.

Hadena arctica, Bdv. At bloom in garden, and came freely to light in July.

Hadena relecina, Morr. Cartwright and Rounthwaite. I think Mr. Marmont took his late, at sugar.

Hadena lignicolor, Gn. One of the abundant species during July at light.

Hadena transfrons, Neum. Occasional, at Brandon, off golden-rod, both during the day and by sweeping after dark.

Hadena indirecta, Grt. Cartwright.

" didonea, Smith. Cartwright.

" modica, Gn. One or two only, at light, towards the end of July.

Hadena mactata, Grt. (This name is on my authority. I have looked over the specimens received from Mr. Hanham, and believe now that I have two good species, neither of them mactata, though both nearly allied to it.—J. B. Smith.) Very common at sugar, from August 24th to nearly the end of September; also taken at light.

Hadena miseloides, Gn. July 19th; one at light.

Hadena fractilinea, Grt. (No. 2060.) Brandon; a few at bloom, and generally off golden-rod.

Xylophasia semilunata, Grt. (No. 2023.) Cartwright.

Trachea delicata, Grt. June 18th to July 19th; at light, but only a few taken.

Hillia crasis, H. S.;

also form senescens, Grt. Rare at light, and at sugar in September.

Hillia algens, Grt. Rather plentiful at sugar, end of August and beginning of September; also some at light.

Oligia festivoides, Gn. Rare at light, in July.

" versicolor, Grt. Rare at light in July.

Platyperigea præacuta, Smith, (?). Rounthwaite; one at sugar in September. (Prof. Smith says his type from Colorado is smaller and less marked.)

Hyppa xylinoides, Gn. A few at light, and on fences early in July. Does not appear to be so plentiful as in the East.

Homohadena badistriga, Grt. A few at light, with seasons about the middle of July.

Homohadena stabilis, Smith. Taken at light on the wing, about the same time, and by no means common.

Oncocnemis atrifasciata, Morr. Taken at Brandon, Carberry, Cartwright, and Rounthwaite, but not yet at Winnipeg. Mr. Boger and Mr. Marmont have taken this beautiful insect at light, the latter, I believe,

in some numbers. I was lucky enough to take one at Rounthwaite at bloom, after dark on August 26th (1897), and on September 14th (1898) I got another at Carberry, flying in the sun about golden-rod.

Oncocnemis Saundersiana, Grt. One at Carberry, on the same occasion as above recorded.

Oncocnemis Chandleri, Grt. Brandon and Rounthwaite.

" cibalis, Grt. Cartwright.

Oncocnemis viriditincta, Smith. A pair at Brandon, and one at Rounthwaite.

(To be continued.)

TWO BRITISH AMERICAN NOCTUIDS.

BY JOHN B. SMITH, SC. D., RUTGERS COLLEGE, NEW BRUNSWICK, N. J.

Among the material sent me for determination by Mr. A. W. Hanham were several species that appear to be undescribed. Some of these have been already published, and others are in the hands of publishers. The following two species are presented at this time because they are referred to in Mr. Hanham's list now published in the CANADIAN ENTOMOLOGIST.

Feltia robustior, n. sp.

Ground colour a sooty gray or brown, with black and white powderings on the body and fore wings. Head slightly darker inferiorly and again behind the antennæ. Collar with a black or brown central line, and a less defined dusky shade edged with white scales at tip. Patagiæ with a brown submarginal line, and the vague discal tufting is also edged with dusky. Abdomen of the usual dirty pale gray. Primaries with the markings fairly well defined. Basal line whitish, diffuse, not well marked, extending into the submedian interspace. T. a. line geminate, black, the included space marked with white scales: from the costa at one-third from base, inwardly oblique to the median vein where it forms nearly a right angle, is then outwardly curved to the internal vein, below which it runs obliquely outward to the inner margin at its middle. The tendency seems to be to obscure the lower portion of this line. T. p. line single, blackish, broken, followed and emphasized by white scales which tend to lighten the s. t. space. As a whole it is outcurved over the cell and very evenly oblique from that point. S. t. line marked by white scales, preceded by a series of black, saggitate marks and forming a W which reaches the outer margin on veins 3 and 4. A series of black terminal

lunules. Fringes with a pale line at base and with a brown interline. All the veins are narrowly black and edged on each side with white scales, which gives the wing a rayed appearance. Claviform long, extending to the middle of the median space, very heavily outlined in black, so as to form the most prominent feature of the wing. Orbicular small, ovate, of the ground colour, black margined. Reniform small, of the ground colour or a little paler, partly outlined in black. Secondaries almost evenly smoky gray, with a vague brown discal lunule and terminal line. Beneath, primaries smoky gray, with a vague discal spot and a series of distinct black terminal lunules. Secondaries powdery white, with a large blackish discal blotch and a series of distinct black terminal lunules.

Expands 1.60–1.68 inches = 40 to 42 mm.

Habitat.—Brandon, Manitoba, August 27, Sept. 1, 1898.

Two male specimens, No. 441, from Mr. Hanham, who says there is a third in Mr. Boger's collection. The new species is near *venerabilis*, but the pectinations of the antennæ are not so long, and, while the body is fully as heavy, the primaries are proportionately longer. The median lines are unusually distinct as compared with its allies, while the pale edging on the median and vein 2 does not tend to form a pale or discoloured streak or band, as in the other species. The antennæ extend to the inception of the t. p. line on the primaries, are well pectinated (male), the branches very densely ciliated.

Philometra Hanhami, n. sp.

Ground colour dark sooty brown, the secondaries lighter in tint. Head and thorax without markings, the abdomen deep mouse gray, also immaculate. Primaries with all the ordinary lines present, but very faint and not at all contrasting. Basal line single, black, very close to the base of the wing and usually marked only by a black dot on the median vein. T. a. line single, blackish, with two wide and one small outcurve, also a little outcurved as a whole. T. p. line blackish, single, narrow, irregular, outcurved over the cell and a little incured in the s. m. interspace. S. t. line pale, preceded by a black shading, which relieves it, with three outcurves which, on the inward bends, are marked by obtuse angles instead of curves. Orbicular wanting. Reniform kidney-shaped, moderate in size and intensely black, making it the most obvious ornamental character. A vague median shade is visible in some specimens. Secondaries paler basally, with a yellowish tinge. Outwardly there is a diffuse,

pale s. t. line, and at about the middle is a narrow smoky transverse line. Beneath smoky brown, paler toward base. A smoky median line, a brown discal spot and a vague outer pale transverse line: all variable in distinctness. The antennæ of the male are pectinated, the branches setose and shorter than in the other described species. The legs are defective in the single example before me, but one remaining fore leg indicates the usual brushlike tuftings. The antennæ in the female have the joints marked and furnished with well-defined lateral bristles.

Expands 1–1.10 inches =25–27 mm.

Habitat.— Winnipeg, Manitoba; Centre, N. Y., July 4, 1879.

Seven specimens are before me, 1 male and 6 females, all more or less imperfect, having met with hard usage in transit. All but one were collected by Mr. A. W. Hanham, who has others, and does not find the species uncommon.

One female was taken by the late W. W. Hill, of Albany, and bears a label in Mr. Grote's handwriting: "Probably new: too poor to serve as type." The specimen reached me some years ago for determination, but has not until the present time found fellows to which it could be referred.

The new form differs at once from the other species of *Philometra* by its dark sooty brown primaries, and from all the species in the subfamily by the contrasting black reniform. The palpi are more sickle-shaped than usual in this genus and more as in *Zanclognatha*, to which I was inclined to refer the species until the male came to hand; but the antennæ do not show the peculiar nodosity at basal third, which is always present in that genus.

ASPIDIOTUS CONVEXUS, Comst. — A CORRECTION.

BY C. L. MARLATT, WASHINGTON, D. C.

The pioneer work done by Prof. Comstock on the Coccidæ of America has put all workers in this group of insects under lasting obligation to him. It was inevitable, however, that, taking up a new subject and handling a vast amount of material for the first time, mistakes should have occurred. An instance in point is the curious mixing up of the material which occurred in the case of the description of the species known as *Aspidiotus convexus*, Comst.

In October, 1880, Prof. Comstock brought from Mr. Ellwood

Cooper's ranch at Santa Barbara, Cal., a scale insect infesting the leaves and twigs of eucalyptus, olive, pear, and fig. The same insect was found on willow at Los Angeles, Cal. From this material, and from other specimens received from various parts of the country, was described the species *Aspidiotus rapax*, Comst. (=*camelliæ*, Sign.), which was named the greedy scale on account of its wide range of food plants.

Collected at Santa Barbara at the same time as the above was a scale, described as being identical with the last, except appearing somewhat larger. It occurred on the bark of the trunk and larger limbs of willow trees, the original specimens being now in the Department collection. Prof. Comstock, in his description of *Aspidiotus convexus*, designates this as the type material of the species named. An examination made some years later, however, showed that the willow scale in question, supposed to represent *convexus*, was in reality Comstock's *rapax*, which latter had also been found on willow in California, as noted, as well as in other places.

It was evident that some mistake or confusion of slides had been made, and the species *convexus* was deemed non-existent. Later, however, a scale insect was received from the West, on willow, which seemed to agree with the description of *convexus* and was referred to this species, and in the course of years a considerable quantity of material referable to *convexus* accumulated in the Department collection, the supposition now being that the type, accidentally or otherwise, had actually been before Prof. Comstock, and had subsequently either been lost or mislaid. The fact, however, that there existed no type material of *convexus* left the matter still open to some doubt, and made it desirable to study, if possible, the preparations in the private collection of Prof. Comstock representing the species.

At the request of the writer, Prof. Comstock kindly sent for examination his type slides of *convexus*. The material received consisted of seven slides, three of which are marked "*convexus*, Comst., type," and proved, astonishingly enough, to belong to *ancylus*, as did also two of the other slides labelled "240 Sub. 1." The other two slides labelled "240 Sub. 2" proved to be *juglans regiæ*. The "type slides" of *convexus* are labelled "No. 746, Aspidiotus on willow, Santa Barbara, Cal.," apparently connecting them with the willow scale collected at that place.

An examination of the type material now brought together for the

first time, and of Prof. Comstock's description of the species in the Agricultural Report for 1880 (page 219), and also his figure of the species (l.c., Plate XII., fig. 8), throws a good deal of light on the difficulty and clears up the confusion which had hitherto existed.

The scale on willow collected at Santa Barbara, Cal., is typical *rapax* (=*camelliæ*), agreeing with the other material of this species collected at the same time and place. The old slide material in the Department of Agriculture, made from the willow scale in question, and later preparations made by the writer, confirm this determination.

The slide material taken away by Prof. Comstock, and labelled as type material, is *ancylus;* the additional material referred to the species being divided between *ancylus* and *juglans regiæ*, as noted.

In the characterization of "*convexus*," Prof. Comstock undoubtedly had this willow material before him, and, in fact, recognized the scales as being indistinguishable from those of *rapax*, a fact noted in the description. At the same time he studied balsam preparations associated with the pinned willow bark, and which he naturally supposed to have been made from the same, noted the presence of the grouped glands distinguishing the species at once from *rapax*, and characterized the insect as a distinct species. In the second paragraph of the description, however, he points out the resemblance in the terminal segment of the "*convexus*" female with the female of *ancylus*. Furthermore, an examination of the figure given of *convexus* indicates that it was undoubtedly drawn from one of the misplaced slides of *ancylus*, of which species it is a characteristic delineation, and is subgenerically distinct from the group to which *rapax* and the supposed *convexus* belong. Through some unfortunate accident, these slides of *ancylus* had become associated with the convex willow scale from California, and an error, very difficult to discover and correct, was made.

It has already been noted that a large quantity of material has accumulated in the collection of the Department which has been referred to *convexus*, and the actual existence of a species closely allied to *rapax*, but distinguished from the latter by the presence of grouped glands, is well established. This scale, in fact, has been described two or three times. It is undoubtedly the species described by Prof. Comstock as *cydoniæ* from quince in Florida. Prof. Comstock recognized

the close relationship of this species to his *convexus*, but having described and figured the adult female of the latter from *ancylus*, the fact of the identity of the two was obscured.

The scale material which we have determined as *convexus* must, therefore, now be referred to *cydoniæ*, Comst. The name *convexus* becomes a synonym of both *camelliæ* and *ancylus*, since the covering scale was described from material representing the former, and the female insect from material representing the latter, species.

Aspidiotus cydoniæ, Comst., has been three times since described as distinct by Prof. T. D. A. Cockerell, his species *Crawii*, *punicæ*, and his variety *lateralis* of Newstead's species *diffinis* belonging to *cydoniæ*. The error in referring "lateralis" to *diffinis* was doubtless occasioned by the fact that the material from which the variety was described for the most part represented immature females, judging from an examination of part of the type material deposited in the National collection.

The *cydoniæ* recognized by E. E. Green in Ceylon (Coccidæ of Ceylon, I., p. 62, Pl. XIV.), and afterwards made the type of *Greenii* by Cockerell, was correctly placed by Green. I may add that the material in the National collection determined by Professor Cockerell as *Greenii* is a mixture of *camelliæ* and *cydoniæ*. The material on banana collected by Mr. Townsend in Mexico (7857) is referable to *cydoniæ*, and also the palm scale collected by Cockerell at Mesilla, N. Mex. The scale on Japanese palm collected at Mexico City, Mex., December 6th, 1897, is a mixture of *cydoniæ* and *camelliæ* in the proportion of about 3 to 1, judging from a single slide mount which contains three females of *cydoniæ* and one of *camelliæ*.

The synonymy of the two species, *cydoniæ* and *camelliæ*, is as follows:

Aspidiotus camelliæ, Sign.	*Aspidiotus cydoniæ*, Comst.
Synonyms: *convexus*, Comst. (in pars).	Synonyms: *Crawii*, Ckll.
euonymi, Targ.	*diffinis*, Newst., var. *lateralis*, Ckll.
lucumæ, Ckll. & Twn. (M. S.)	*Greenii*, Ckll.
rapax, Comst.	*punicæ*, Ckll.

CLASSIFICATION OF THE ENTOMOPHILOUS WASPS, OR THE SUPERFAMILY SPHEGOIDEA.

BY WILLIAM H. ASHMEAD, ASSISTANT CURATOR, DIVISION OF INSECTS, U. S. NATIONAL MUSEUM.

(Paper No. 3.)

Subfamily IV.—Thyreopinæ.

The absence of a distinct ridge, carina or crest on the mesopleura just in front of the middle coxæ, an important structural character first made use of by Kohl, the recurrent nervure in the front wings joining the first cubital cell at or at least nearer the middle than the apex, and the great differences noticeable in the antennæ and the metathorax, readily separate this group from the Crabroninæ.

To me the Thyreopinæ seem to represent a large and distinct group, allied to the others it is true, but yet quite distinct, and divisible into many easily recognizable subgenera. It will be seen also that instead of suppressing the genera erected by some of the older entomologists, which fall in this group, and lumping them with Crabro, as has been done by Kohl and Fox, I have instead recognized all of the genera of Latreille, Dahlbom, Lepeletier, etc., and besides have founded some additional genera. All of these, I think, can be easily recognized by the student, with the use of the following table:

Table of Genera.

Ocelli arranged in an equilateral triangle or nearly ∴, the lateral ocelli about as far from each other as to the front ocellus; thorax more or less smooth or polished, shining, the metathorax feebly sculptured, almost smooth, its posterior face sometimes rugulose.....6.

Ocelli arranged in an obtuse triangle ∴, the lateral ocelli being about twice as wide from each other as to the front ocellus; thorax with at least the metathorax rugulose, opaque, often very coarsely sculptured, the metanotum usually without, or with a poorly defined triangular or semicircular area, the posterior face often with a distinctly defined *cordate area;* the recurrent nervure joins the cubitus at or distinctly beyond the middle of the first cubital cell; abdomen always marked with yellow above; pygidium in ♀ always flat, triangular.

Males.....4.

Females:

Superorbital foveæ sharply defined, large oblique, or at least

indicated by a large oblique depression on the surface.....3.

Superorbital foveæ always wanting, never sharply defined, at most indicated only by a scarcely perceptible depression between the lateral ocelli and the eyes.

Third antennal joint longer than the fourth ; metanotum with the semicircular area very coarsely, irregularly reticulate or rugose,the posterior face reticulate or transversely wrinkled, with a deep median sulcus; recurrent nervure uniting with the cubitus at or a little before the apical third of the cubital cell ; abdomen alutaceous or coriaceous, impunctate, the first segment highly polished.....Anothyreus, Dahlb.

[Type A. lapponicus, Dahlb.]

Third antennal joint shorter than the fourth ; metathorax coarsely irregularly reticulate, the posterior face smoother, not transversely wrinkled ; mandibles at apex truncate or bluntly rounded, with a small tooth within before apex ; clypeus anteriorly quadrately produced medially, with acute lateral angles.....Paranothyreus, Kohl.

[Type C. hilaris, Smith.]

3. Mandibles at apex bidentate, the inner tooth the larger, bluntly rounded ; thorax closely punctate, opaque, and often with longitudinal aciculations ; metathorax punctate, with a median longitudinal sulcus posteriorly, the triangular area at base rather small reticulate or alveolate.

Clypeus anteriorly broadly quadrately produced ; recurrent nervure in front wings received by the cubital cell much before its apical third.....Synothyreopus, Ashm., n. g.

[Type C. tumidus, Pack.]

Clypeus anteriorly, not quadrately produced, rounded, or at most semicircularly produced ; recurrent nervure in front wings received by the cubital cell at or beyond the apical third, rarely before.....Thyreopus, Latreille.

[Type C. cribrarius, Fabr.]

4. Anterior legs abnormally developed, the trochanters, the femora or tibiæ, or altogether broadened, most frequently with a shieldlike expansion on the tibiæ. 5.

Anterior legs normally developed, the tibiæ without a shieldlike expansion,

Superorbital foveæ wanting, never sharply defined, at the most represented by slight glabrous depressions; middle tibiæ with an apical spur.

Metathorax coarsely irregularly rugose, with a deep furrow on the posterior face, the latter also usually transversely wrinkled; mesonotum finely coriaceous, opaque, very sparsely punctate; anterior and middle tibiæ with a sparse flocculus beneath.....Anothyreus, Dahlbom.
[Type A. lapponicus, Dahlb.]

Metathorax coarsely reticulate; pronotum with acute lateral angles anteriorly; mesonotum closely punctate, opaque, not aciculate; mesopleura with a conical tubercle before the middle coxæ; trochanters and femora beneath clothed with a rather long, thick, white floc-
culus Paranothyreus, Kohl.
[Type C. hilaris, Smith.]

5. Superorbital foveæ sharply defined, distinct, oblique, usually dull or opaque at bottom; metathorax rugose, opaque, with a deep median sulcus on posterior face; mesonotum closely punctate, opaque, often longitudinally aciculate or striate.

Antennæ with the flagellum not fusiform, hardly compressed, the joints not or scarcely wider than long, the first two always longer than wide; clypeus anteriorly quadrately produced; anterior tarsi not especially broad, without an
appendage.....Synothyreopus, Ashm., n. g.
[Type C. tumidus, Pack.]

Antennæ with the flagellum fusiform, compressed, the joints much widened, the first three or four joints fully twice as wide, or wider, than long; clypeus anteriorly, not quadrately produced, at the most semicircularly produced; anterior tarsi broad, dilated, with an appendage Thyreopus, Lep., et. Br.
[Type C. cribarius, Fabr.]

6. The recurrent nervure in front wings received by the cubital cell at or near the middle, or only slightly beyond the middle; abdomen usually immaculate, without yellow marks; mandibles at apex bidentate or tridentate; eyes strongly convergent below, the antennal sockets in consequence being very close to the eye margin.....7.

The recurrent nervure in front wings received by the cubital cell distinctly or considerably beyond the middle; abdomen most frequently marked with yellow, rarely immaculate; metathorax feebly sculptured, with a well-defined cordate area on the posterior face..9.

7. Males 8.

Females:

Superorbital foveæ sharply defined, linear or wedge-shaped, and usually connected with a depression behind the lateral ocelli; abdomen polished impunctate, or at most finely, microscopically punctate; pygidium narrowed, foveated. Blepharipus, Lepel., et.Br.
[=Cœlocrabro, Thoms.*]
[Type B. nigrita, Lepel.]

Superorbital foveæ wanting, or never sharply defined, indicated only by a slight cicatrix or glabrous mark; metanotum with a well-defined semicircular area, divided by a median grooved line; abdomen smooth, impunctate, the pygidium flat, triangular, not excavated, and clothed with glittering hairs.....Crossocerus, Lep., et. Br.
[Type C. scutatus, Lepel.]

8. Superorbital foveæ sharply defined; metathorax with the cordate area *not* well defined, usually subobsolete; front legs and antennæ normal; middle tibiæ with an apical spur.

Clypeus anteriorly narrowly produced and roundly emarginate; head quadrate or subquadrate, the superorbital foveæ linear or wedge-shaped; abdomen not or scarcely longer than the head and thorax united, polished.....Blepharipus, Lepel.
=Cœlocrabro, Thoms.
[Type B. nigrita, Lepel.]

Clypeus narrowly produced medially and sinuate on each side of the production; head large, nearly quadrate, the superorbital foveæ distinct but not large, pyriform; abdomen not very long.....Epicrossocerus, Ashm., n. g.
[Type C. insolens, Fox.]

Clypeus subsemicircularly produced, not emarginate; superorbital foveæ curved, linear or lunulate; hind tibiæ strongly clavate; abdomen greatly elongate, about twice as long as the head and

* Blepharipus was subdivided by Morawitz and others before Thomson, which left *nigrita* as the type.

thorax united. (♀ unknown). Alaska..Dolichocrabro, Ashm., n.g.
[Type D. Wickhamii, Ashm.]

Superorbital foveæ not sharply defined, wanting, or at most indicated by a cicatrix or a slightly depressed glabrous line ; metathorax with a well-defined cordate area ; clypeus not emarginate anteriorly.

Front legs abnormal, the tibiæ *with* a shieldlike expansion Crossocerus, Lepel.
[Type C. scutatus, Fabr.]

Front legs normal or nearly, the tibiæ *without* a shieldlike expansion, the tarsi somewhat flattened, or at most subdilated Stenocrabro, Ashm., n. g.
[Type C. planipes, Fox.]

9. Males 10.

Females :

Superorbital foveæ wanting, or at most indicated by a glabrous depression, the occipital line or margin produced into a tooth beneath the temples ; mandibles without a tooth within, truncate or blunt at apex, indistinctly bidentate ; metathorax very feebly sculptured, with a well-defined, smooth, semicircular area at base ; abdomen smooth, sometimes with yellow maculæ ; anal lobe in hind wings as long as the submedian cell. Hoplocrabro, Thomson.
[Type C. quadrimaculatus, Fabr.]

Superorbital foveæ distinct, sharply defined, pear-shaped or broadly depressed, the occipital line normal, not ending in a tooth beneath the temples ; ocelli in an equilateral triangle ; mandibles with a tooth within near the middle, at apex tridentate ; metathorax almost smooth, shining, with a well-defined semicircular area at base ; abdomen polished ; the first segment somewhat lengthened, the pygidium triangular, punctate ; anal lobe in hind wings shorter than the submedian cell..... Cuphopterus, Morawitz.
= Blepharipus, Auc. *pars*.
[Type C. subulatus, Dahlb.]

10. Superorbital foveæ wanting, or at most indicated by a glabrous depression, never sharply defined, the occipital line or margin produced into a tooth beneath the temples ; mandibles *without* a tooth within ; at apex bidentate..... Hoplocrabro, Thomson.

Superorbital foveæ distinct, sharply defined, pear-shaped, or broadly depressed ; mandibles *with* a tooth within, at apex bidentate..... Cuphopterus, Morawitz.

North American Species.

(19) ANOTHYREUS, Dahlbom.
(1) A. hispidus, Fox, ♀.
(20) PARANOTHYREUS, Kohl.
(1) P. cingulatus, Pack., ♀ ♂.
(2) P. cognatus, Fox, ♀ ♂.
(3) P. hilaris, Smith, ♀ ♂.
(4) P. Snowii, Fox.
(21) SYNOTHYREOPUS, Ashmead.
(1) S. conspicuus, Cr., ♀.
(2) S. advenus, Smith, ♀ ♂.
(3) S.thyreophorus,Kohl, ♀ ♂.
(4) S. vernalis, Pack., ♀ ♂.
(5) S. virgatus, Fox, ♂.
(6) S. incertus, Fox, ♀ ♂.
(7) S. tumidus, Pack., ♀ ♂.
(8) S. tenuiglossus, Pack., ♀ ♂.
(22) THYREOPUS, Latreille.
(1) T. largior, Fox, ♀ ♂.
(2) T. pleuralis, Fox, ♀ ♂.
(3) T. monticola, Pack., ♀ ♂.
(4) T. pallidus, Fox, ♀ ♂.
(5) T. aequalis, Fox, ♀.
(6) T. discretus, Fox, ♀.
(7) T. argus, Pack., ♀ ♂.
(8) T. tenuis, Fox, ♀ ♂.
(9) T. medius, Fox, ♀ ♂.
(10) T. Provancheri, Fox, ♀.
(11) T. crebellifer, Pack., ♂.
(12) T. latipes, Smith, ♂.
(13) T. vicinus, Cr., ♀.
(14) T. alpestris, Cam., ♂.
(15) T. alticola, Cam., ♂.
(16) T. peltasta, Kohl, ♂.
(23) BLEPHARIPUS, Lepel. et Brullé.
(1) B. impressifrons, Smith, ♀ ♂
=tibialis, Say, nec Fab.
(2) B. Harringtonii, Fox, ♀.
(3) B. nigricornis, Prov., ♀ ♂.
(4) B. nigrior, Fox, ♀.
(5) B. cinctipes, Prov., ♀ ♂.
(6) B. ater, Cr., ♀ ♂.
(24) EPICROSSOCERUS, Ashmead.
(1) E. insolens, Fox.
(25) DOLICHOCRABRO, Ashmead.
(1) D. Wickhamii, Ashm., ♂.
(26) CROSSOCERUS, Lepel. et Brullé.
(1) C. Harrisii, Pack., ♂.
(2) C. sulcus, Fox, ♀ ♂.
(3) C. pictipes, Fox, ♂.
(4),C. incavus, Fox, ♀.
(5) C. minimus, Pack., ♀.
(6) C. propinquus, Fox.
(7) C. maculiclypeus, Fox, ♀ ♂.
(8) C. lentus, Fox, ♀.
(27) STENOCRABRO, Ashmead.
(1) S. planipes, Fox, ♂.
(2) S. tarsalis, Fox, ♂.
(3) (?) unicus, Pattn., ♀.
(28) HOPLOCRABRO, Thomson.
(29) CUPHOPTERUS, Morawitz.
(1) C. maculipennis, Smith, ♀ ♂.
(2) C. confertus, Lepel.
(3) C. nitidiventris, Fox, ♀ ♂.
(4) C. ventralis, Fox, ♀.

SUBFAMILY IV.—Rhopalinæ.

This group is readily separated from the others by the petiolate abdomen, or at least by the long and petioliform first abdominal segment, which is usually without distinct lateral carinæ.

The subfamily otherwise, however, seems to be closely allied in the structure of the thorax, and in wing characteristics, to both the *Lindeniinæ* and the *Thyreopinæ*; but besides the long, petioliform first abdominal segment, which separates the group from both, it is also separated from the former by the bidentate, not simple, mandibles, while from the latter it is also distinguished, as a rule, by antennal, mandibular, palpial and other differences.

The group may be divided into the following subgenera:

Table of Genera.

Maxillary palpi 5-jointed; labial palpi 3-jointed; mandibles bidentate at apex, very exceptionally blunt at apex in ♀.....3.

Maxillary palpi 6-jointed.

Labial palpi 3-jointed; mandibles bidentate.....2.

Labial palpi 4-jointed.

Mandibles at apex in ♀ tridentate, in ♂ bidentate; mesopleura bounded anteriorly and posteriorly by a sharp ridge or carina; head, thorax and abdomen opaque, very finely rugulose; body of abdomen oval or subovate, marked with yellow, the petiole or first segment subclavate; pygidial area in ♀ narrowed, foveate; recurrent nervure in front wings received by the cubital cell beyond the middle; antennæ in ♀ 12-, in ♂ 13-jointed.....Dasyproctus, Lep. et Br.

=Megapodium, Dahlb.

[Type D. bipunctatus, Lep.]

Mandibles in both sexes bidentate; ocelli triangularly arranged; mesopleura bounded by a sharp carina anteriorly, but not posteriorly; head and thorax finely, closely, minutely punctate; metanotal area distinct, smooth, polished, with some striæ at base, the posterior face with the cordate area well defined; abdomen clavate, impunctate, not marked with yellow, the petiole subclavate; pygidial area triangular, flat, not foveate; recurrent nervure in front wings received by the cubital cell a little before the middle; antennæ in ♀ 12-jointed, the third joint the longest, twice the length of the pedicel. (Male unknown).....Synorhopalum, Ashm., n. g.

[Type C. decorus, Fox.]

2. Face below rather broad, the eyes only slightly convergent towards

the clypeus; clypeus very short, not triangularly acute; antennal sockets somewhat distant from each other, but still wider from the eye margin than to each other; third antennal joint much shorter than the fourth, the latter being the longest joint; abdomen marked with yellow, the pygidium in ♀ narrow, somewhat lengthened.....Brachymerus, Dahlb.
=Tracheliodes, Morawitz.
=Fertonius, Perez.
[Type B. megerlei, Dahlb.]

Face narrowed below, the eyes convergent towards the clypeus; ocelli subtriangularly arranged; clypeus anteriorly medially produced, the angles of same acute; antennal sockets nearer to the eye margin than to each other, but still close together; third antennal joint not longer than the fourth, but shorter than the second or pedicel; mesopleura not bounded by a carina posteriorly; metanotal area smooth, with some short striæ at base; abdomen clavate, not marked with yellow, the pygidial area triangular, rounded at apex; antennæ in ♂ 13-jointed, normal, none of the joints emarginate or compressed; mandibles with a large tooth or process beneath near the base.....Alliognathus, Ashm., n. g.
[Type C. occidentalis, Fox.]

3. Abdominal petiole clavate, subglobosely swollen at apex.....4.
Abdominal petiole subclavate, or very gradually thickened towards apex, never subglobosely swollen at apex.

Mesosternal suture wanting or indistinct.

Head obtrapezoidal; eyes pyriform, convergent anteriorly towards the clypeus; ocelli arranged in a regular triangle; body feebly coriaceously opaque; recurrent nervure in front wings received by the cubital cell at about the middle; pygidium triangular, punctate, distinct.....Microcrabro, Saussure.
[Type M. micromegus, Sauss.]

Head similar, but larger, a little longer than wide, the temples very broad; superorbital foveæ sharply defined, linear; ocelli arranged in an equilateral triangle, and rather widely separated; a strong spine between bases of antennæ; head and thorax somewhat coarsely, rugosely punctate; recurrent nervure in front wings received by the cubital cell a little before the middle; pygidium triangular, flat; antennæ in ♀

12-, in ♂ 13-jointed; the terminal joint in the latter compressed, dilated; the others normal. . Moniæcera, Ashm., n. g.
[Type C. abdominalis, Fox.]

Mesosternal suture distinct, extending to the middle coxæ, and distinctly separating the mesosternum.

Head subquadrate or obtrapezoidal, wider than long, the temples not especially broad; mandibles at apex in ♀ truncate, blunt, in ♂ bidentate; antennæ in ♀ 12-, in ♂ 13-jointed, the latter deformed, some of the joints emarginate beneath; metathorax coarsely rugose; recurrent nervure in front wings received by the cubital cell distinctly beyond the middle; pygidium in ♀ flat, triangular. . Podagritus, Spinola.
[Type P. Gayi, Spin.]

4. Mesosternal suture wanting; mandibles in both sexes bidentate; ocelli triangularly arranged.

Metathorax smooth, the cordate area on the posterior face, more or less distinctly defined; antennæ in ♀ 12-, in ♂ 13-jointed, the latter deformed, some of the flagellar joints depressed or emarginate beneath; recurrent nervure in front wings received by the cubital cell far beyond the middle. . . . Rhopalum, Kirby.
=Corynopus, Lep., et Br.
[Type R. tibiale, Fabr.]

Metathorax feebly punctate, the cordate area less distinct; antennæ in ♀ 12-, in ♂ 13-jointed, the latter normal, none of the joints emarginate; recurrent nervure in front wings received by the cubital cell at or near the middle. . Physoscelis, Lepel., et Br.
[Type C. clavipes, Linne.]
[=rufiventris, Panz.]

North American Species.

(30) Dasyproctus, Lepeletier and Brullé.

(31) Synorhopalum, Ashmead.
(1) S. decorus, Fox, ♀.

(32) Brachymerus, Dahlbom.

(33) Alliognathus, Ashmead.
(1) A. occidentalis, Fox, ♀ ♂.

(34) Microcrabro, Saussure.

(35) Moniæcera, Ashmead.
(1) M. abdominalis, Fox, ♀.
(2) M. asperatus, Fox, ♂.

(36) Podagritus, Spinola.
? uncertain.
(1) P. fulvohirtus, Cam.
(2) P. maculitarsis, Cam.
(3) P. jason, Cam.

(37) Rhopalum, Kirby.
(1) R. pedicellatum, Pack., ♀ ♂.
(2) rufigaster, Pack., ♀ ♂.

FAMILY XVII.—Pemphredonidæ.

The difference in venation of the hind wings and the distinctly petiolate abdomen, as well as the venation of the front wings, readily distinguish this family from the *Crabronidæ*. In the former family the median cell is fully twice as long as the submedian, while in the *Pemphredonidæ* it is not twice as long as the submedian cell.

Two subfamilies have been recognized, distinguished as follows :

Table of Subfamilies.

Antennæ inserted close to the base of the clypeus ; front wings with two cubital cells, rarely with one only . . Subfamily I., Pemphredoninæ.

Antennæ inserted far above the clypeus on or near the middle of the face ; front wings with three cubital cells . . . Subfamily II., Pseninæ.

SUBFAMILY I.—Pemphredoninæ.

The insertion of the antennæ far forward, close to the base of the clypeus, is the only reliable character to separate the subfamily from the Pseninæ, although, as a rule, the head is larger, more quadrate, and the venation of the front wings is also different.

The genera may be recognized by the use of the following table :

Table of Genera.

Front wings with two recurrent nervures 4.

Front wings with only one recurrent nervure.

Front wings with two cubital cells 2.

Front wings with only one cubital cell.

Marginal cell short, triangular ; clypeus triangularly pointed anteriorly or with a slight median production ; mandibles bidentate, the lower tooth the longer Ammoplanus, Girard.

2. Petiole of abdomen long 3.

Petiole of abdomen short.

Second cubital cell quadrate ; recurrent nervure interstitial with the first transverse cubitus or nearly ; mandibles bidentate Spilomena, Shuckard.

3. Recurrent nervure received by the first cubital cell near its middle or little beyond ; second cubital cell quadrate ; ventral plate in ♀ normal ; mandibles bidentate Stigmus, Jurine.

Recurrent nervure received by the second cubital cell at its lower basal angle or interstitial with the first transverse cubitus ;

second cubital cell triangular; ventral plate in ♀ armed with a spine.....Harpactophilus, Smith.

4. Abdomen with the petiole never longer than the hind coxæ.....5.
Abdomen with the petiole longer than the hind coxæ; mandibles 3-dentate.
First cubital cell receiving both recurrent nervures, or the second recurrent is interstitial with the first transverse cubitus.....Cemonus, Jurine.
=Diplebus, Westw.
First and second cubital cells each receiving a recurrent nervure; second cubital cell large, usually quadrate.....Pemphredon, Shuckard.

5. Hind tibiæ along the outer face spinous or subserrate.....6.
Hind tibiæ along the outer face smooth, unarmed.
Head armed with a spine or tubercle between the antennæ; labrum not triangularly produced.....Ceratophorus, Shuckard.
Head unarmed; labrum triangularly produced..Passaloecus, Shuck.

6. Head seen from in front wider than long; clypeus at apex emarginate; abdomen ovate, not longer than the head and thorax united, the petiole very short.....Diodontus, Curtis.
Head seen from in front elongate, longer than wide; clypeus not emarginate; abdomen elongate, slender, cylindrical, longer than the head and thorax united.....Polymistus, Saussure.

North American Species.

(1) Ammoplanus, Girard.
- (1) A. columbianus, Kohl., ♀.
- (2) A. constrictus, Prov. (Anacrabro), ♀.
- (3) A. laevis, Prov. (Anacrabro), ♀.

(2) Spilomena, Shuckard.
- (1) S. pusilla, Say, ♀.
- (2) S. Foxii, Ckll.

(3) Stigmus, Jurine.
- (1) S. americanus, Pack., ♀ ♂.
- (2) S. inordinatus, Fox, ♀ ♂.
- (3) S. fraternus, Say, ♀ ♂.
- (4) S. fulvipes, Fox, ♀.
- (5) S. parallelus, Say, ♀.
- (6) S. podagritus, Kohl, ♀.
- (7) S. montivagus, Cam., ♀.

(4) Harpactophilus, Smith.

(5) Cemonus, Jurine.
- (1) C. inornatus, Say.
- (2) C. bipartior, Fox, ♀.
- (3) C. tenax, Fox, ♀ ♂.

(6) Pemphredon, Shuckard.
- (1) P. concolor, Say, ♀ ♂.
- (2) P. angularis, Fox, ♀ ♂.
- (3) P. nearticus, Kohl, ♀ ♂.

(4) P. Rileyi, Fox, ♀ ♂.
(5) P. confertim, Fox, ♂.
(6) P. Provancheri, Ashm., ♀. = concolor, Prov., nec. Say.
(7) P. montanus, Dahlb., ♀ ♂.
(8) P. (?) marginatus, Say.
(7) Ceratophorus, Shuckard.
(8) Passaloecus, Shuckard.
(1) P. annulatus, Say, ♀ ♂.
(2) P. relativus, Fox, ♂.
(3) P. distinctus, Fox, ♂.
(4) P. mandibularis, Cress, ♀ ♂.
(5) P. dispar, Fox, ♂.
(6) P. cuspidatus, Smith, ♀.
(7) P. armeniaciæ, Ckll. and Fox.
(9) Diodontus, Curtis.
(1) D. occidentalis, Fox, ♀ ♂.
(2) D. rugosus, Fox, ♂.
(3) D. flavitarsis, Fox, ♂.
(4) D. americanus, Pack., ♀ ♂.
(5) D. Gillettei, Fox, ♀.
(6) D. luguminiferus, Ckll, ♂.
(7) D. nigritus, Fox, ♀.
(10) Polymistus, Saussure.

Subfamily II.—Pseninæ.

In this subfamily, the species, as a rule, are narrower and more elongate; the head less distinctly quadrate, more transverse, with narrower temples; the front wings with three cubital cells; while *the antennæ are always inserted on or near the middle of the face, far above the clypeus.*

Psen, Latreille, was the first genus to be described, but the description was a broad one, and included all the species known at that time. It was subsequently, however, subdivided by Shuckard and others, and in order to do justice to these authors, and to prevent the erection of new generic names, I prefer to follow them in preference to Kohl, who would restrict all to a single genus, with *Sphex atra*, Fabr. (Panzer), as the type.

This was also the *status* of the subgenera up to the appearance of Kohl's work in 1896, and was acceded to and accepted by all active Hymenopterologists, and I can see no good reason for making a change in our definition of these subgenera at this late date, and thus bring confusion into our nomenclature and text-books.

The genera recognized may be tabulated as follows:

Table of Genera.

Cubitus in hind wings originating *beyond* the transverse median nervure, the latter short and straight, perpendicular.....2.

Cubitus in hind wings originating *before* the transverse median nervure, the latter long and oblique or slightly bent, but *not* perpendicular.

Second cubital cell receiving both recurrent nervures, *rarely* with the first recurrent nervure interstitial with the first transverse

cubitus, or the second recurrent interstitial with the second transverse cubitus ; inner spur of hind tibiæ dilated ; metathorax with a median sulcus, the area at base striate or alveolate ; petiole of abdomen long, usually furrowed laterally ; clypeus convex or subconvex, separated, anteriorly more or less rounded, and with a slight vein, but without a median sinus ; labrum hidden.....Mimesa, Shuckard.

=Aporia, Wesm.

[Type M. equestris, Lind.]

Second and third cubital cells each receiving a recurrent nervure, or the first recurrent nervure is interstitial with the first transverse cubitus ; head with a spine between the antennæ ; clypeus anteriorly rimmed, and with a median sinus.....Dahlbomia, Wissmann.

=Mesopora, Wesmael.

=Psen, Kohl.

[Type Sphex atra, Panz.]

2. Submedian cell in front wings a little shorter than the median, the transverse median nervure being not quite interstitial with the basal nervure ; second cubital cell usually much narrower above.

Second and third cubital cells each receiving a recurrent nervure, rarely with the first recurrent nervure interstitial with the first transverse cubitus.....Psen, Latreille.

=Psenulus, Kohl pars.

[Type P. atratus, Panz.]

Second cubital cell receiving both recurrent nervures.....Psenulus, Kohl.

[Type M. fuscipennis, Dahlb.]

North American Species.

(11) MIMESA, Shuckard.

(1) M. chalcifrons, Pack., ♀.
(2) M. argentifrons, Cross., ♀ ♂.
(3) M. Cressonii, Pack., ♀ ♂.
(4) M. borealis, Smith, ♀ ♂.
(5) M. clypeata, Fox, ♀ ♂.
(6) M. pauper, Pack., ♀ ♂.
(7) M. unicincta, Cress., ♀ ♂.
(8) M. proxima, Cress., ♀.
(9) M. basirufa, Pack., ♀ ♂.
(10) M. cylindricus, Fox., ♀ ♂.
(11) M. regularis, Fox, ♀.
(12) M. niger, Pack., ♀ ♂.
(13) M. mixta, Fox, ♀ ♂.
(14) M. leucopus, Pack., ♀ ♂.
(15) M. cingulata, Pack. ♂.
(16) M. granulosus, Fox,, ♂.
(17) M. gregaria, Fox, ♂.

(18) M. maculipes, Fox, ♂.
(19) M. longicornis, Fox, ♂.
(20) M. mellipes, Say, ♀ ♂.
(21) M. monticola, Pack., ♀ ♂.
(22) M. Mexicana, Cam , ♀.
(23) M. pulchra, Cam., ♀.
(24) M. striolata, Cam., ♀.
(25) M. longiventris, Cam., ♀.
(26) M. Cameroni, Ashm., ♀.
=monticola,Cam.,nec.,Pack.
(27) M. Montezuma, Cam., ♀.
(28) M. claviventris, Cam., ♀.

(12) DAHLBOMIA, Wissman.
(13) PSEN, Latreille.
(1) P. frontalis, Fox, ♀.
(2) P. trisulcus, Fox, ♀.
(3) P. kohlia, Fox, ♀ ♂.
(4) P. punctatus, Fox, ♀.
(5) P. simplicicornis, Fox, ♀.
(6) P. fuscipes, Pack.
(7) P. tibialis, Cr., ♀ ♂.
(8) P. suffusus, Fox, ♀.
(9) P. annulipes, Cam.
(14) PSENULUS, Kohl.

CONTRIBUTIONS TO THE KNOWLEDGE OF MASSACHUSETTS COCCIDÆ.—III.

BY GEO. B. KING, LAWRENCE, MASS.

Diaspinæ.

(46) *Aspidiotus hederæ*, Vall.; 1829–1897. I.

This is a very common pest in all greenhouses at Lawrence, and no doubt in all greenhouses in the State. It is found at Lawrence on Ivy, Palms and Cycas. A variety determined by Prof. Cockerell as probably *ericæ*, Boisd., on heather *(Erica)* in a greenhouse at Lawrence. The scale is longer than typical *hederæ*, and of a yellowish cast, and also covered more or less with the epidermis of the plant. *Hederæ* has been recorded from Kansas, Utah, Illinois, California, Florida, Colorado, New Mexico, and New York, on Ivy, China-tree, Lemon, Oleander, Orange, Lace-fern = Asparagus plumosa, Acacia, Maple, Yucca, Plum, Cherry, Currant, Melia, Grass and Clover.

(47) *Aspidiotus aurantii*, Mask.; 1878–1897. I.

Very common species on orange and lemon exposed for sale in fruit stores. Some of the fruit was completely covered with the scales and unfit for sale. They came from California and Florida. It is recorded from Arizona, California, and Illinois, on orange, lemon, grape, and rose.

(48) *Aspidiotus perniciosus*, Comst.; 1881–1895. N.

Recorded from 19 localities in this State, on apple, pear, peach, and rose. It has been reported from Alabama, Arizona, Colorado, California, North Carolina, Connecticut, Delaware, Florida, Georgia, Illinois, Idaho,

Indiana, New Jersey, Kansas, Kentucky, Louisiana, Missouri, Michigan, New Mexico, New York, Nevada, Oregon, Oklahoma, Ohio, Pennsylvania, Washington St., Virginia, West Virginia, and Vermont, on apple, peach, plum, prune, pear, quince, rose, grape, spiræa, apricot, currant, elm, walnut, corn, sugar-cane, etc. Mr. Schwarz has found the young of *perniciosus* in an ants' nest, *Monomorium minutum*, Mayr., in Virginia.

(49) *Aspidiotus ancylus*, Putn.; 1877–1898. N.

Injurious in a few instances, at Malden, Charles Bank Park, Everett, and Lawrence, Mass., on Apple, Honey Locust, and *Spiræa aruncus*. Recorded from Colorado, Illinois, Iowa, Kansas, Maryland, Minnesota, New York, New Mexico, Ohio, Virginia, Washington, D. C., and Washington St., on Fay currant, quince, Wrightii apple, English oak, pear, osage orange, peach, water-locust, maple, linden, hackberry, black nut, beech, and ash.

(50) *Aspidiotus ficus*, Ashm.; 1888–1897. I.

Frequently found in greenhouses at Lawrence, Mass., on orange, rubber plant, palms, and on orange, lemon, and banana in fruit stores. Recorded from Texas, Florida, New Mexico, Louisiana, Georgia, Ohio, and Colorado, on orange, lemon, Ficus, sp. *Laurus virginiana*, cocoanut palm, *Oreodoxa regia*, *Curcuma longa*, *Pandanus*, *Cœlogyne cristata*, *gambolana*, *Myrtus Hillii*, camphor, and rose.

(51) *Aspidiotus articulatus*, Morg.; 1889–1898. I.

Found on limes in a fruit store at Lawrence, probably from Jamaica. It is known from West Africa, Demerara, Trinidad, Jamaica, and Nevis. It is not known to inhabit any portion of the United States.

(52) *Aspidiotus Forbesi*, Johnson; 1896–1898. N.

At Reading and Shady Hill, Mass., on *Acer pseudoplatanus* and apple; coll. Mr. Kirkland. It is found at New Mexico, Kansas, Illinois, Maryland, Georgia, and West Virginia, on apple and cherry.

(53) *Aspidiotus Fernaldi*, Ckll.; 1898–1898. N.

Found at Charles Bank Park on *Gleditschia triacanthos*, by Messrs. Kirkland and Cooley.

(54) *Aspidiotus smilacis*, Comst.; 1883–1898. N.

On Smilax, at Woods' Holl, Mass.; found by Prof. Trelease (Comstock, Cornell Rept., 1883).

(55) *Aspidiotus sp.* (prob. young of *A. dictyospermi*, Morg.); 1889–1898. I.

Found by Mr. J. W. Folsom at the Botanic Gardens, Cambridge, Mass. (Ckll. in litt.). It is recorded from Colorado, found in a greenhouse on *Champœropsis elegans.*

(56) *Aspidiotus Crawii*, Ckll.; 1897–1899. I.

On ivy, *Hedera*, in a greenhouse at Lawrence, Mass., only known hitherto from Mexico, found there by Prof. C. H. T. Townsend, on fruit of some palm.

(57) *Aspidiotus cyanophylli*, Sign.; 1869–1899. I.

In a greenhouse at Lawrence, Mass., on a plant called *Cobo japonica*, on *Ficus*, M. S. (Comstock, Cornell Rpt., 1883, p. 39), on *Cyanophyllum*, at Paris, in a greenhouse (Signoret) on palm and *Cycas* in Ceylon according to Green. Also in Mexico.

(58) *Diaspis carueli*, Targ.; 1868–1895. I.

Mr. J. G. Jack found this species at Jamaica Plain, Mass., on *Juniperus sphœrica.* It has been found at Washington, D. C., on various species of Juniperus.

(59) *Diaspis amygdali*, Tryon; 1889–1898. I.

At Jamaica Plain on *Prunus mume* and *P. subhirtella;* also at Charles Bank Park, Boston, on *Gledistschia triacanthos*, by Mr. Kirkland. It is said to occur at Ohio on Japan flowering cherry. As *lanatus* it is reported from Washington, D. C., Georgia, Florida, and California.

(60) *Aulacaspis rosæ*, Bouché; 1833–1898. I. Syn. *Diaspis rosæ*, Bouché.

A common pest on *Rubus canadensis*, *R. strigosus*, *R. occidentalis*, and a number of species of rose bushes, also wild rose bush at Lawrence, Methuen and Andover, Mass.; recorded from New Jersey, Pennsylvania, Ohio, Missouri, Illinois, Delaware, California, and Arizona, on rose, raspberry and blackberry. A *Chiloneurus*, n. sp., has been reared from scales found at Andover, Mass., 1898.

(61) *Aulacaspis bromeliæ*, Kerner; 1788-1862. I.

At Plum Island, Amherst and Cambridge, Mass., on *Acacia*, *Olea fragans*, *Guidia? simplex* and ivy. In greenhouses at Amherst and Cambridge, also in the Botanic Gardens at Cambridge. It is recorded from California on pineapple in a greenhouse.

(62) *Aulacaspis Boisduvalii*, Sign ; 1869-1897. I.

On palms in greenhouses at Lawrence, Mass.; also at Denver Colorado, on palms in greenhouse.

(63) *Aulacaspis elegans*, Leon ; 1899. I. Syn. *Howardia elegans.*

On *Cycas revoluta* in a greenhouse at Lawrence, Mass. The plant was imported from Bermuda last year. The species was only known from Portici, Italy, on *Cycas revoluta.*

(64) *Parlatoria proteus*, Curt., var. *Pergandei*, Comst.; 1881-1897. I.

Very common on oranges and lemons at Lawrence, Mass., in markets. It is recorded from Florida on orange and lemon ; at California on imported date palm.

(65) *Parlatoria zizyphus*, Lucas ; 1853-1897. I.

On lemons exposed for sale in fruit stores. I have no record of its being found infesting any trees in the United States. It is recorded from Africa.

(66) *Parlatoria* (prob. *proteus*, var. *crotonis)*, Ckll.; 1895-1898. I.

Found at the Cambridge Botanic Gardens by Mr. J. W. Folsom (Ckll. in litt.).

(67) *Mytilaspis pomorum*, Bouché ; 1851-1862. I.

One of the most common coccid pests at Lawrence, Methuen, Andover and Springfield, Mass., and no doubt in every town in the State, on willow, poplar, lilac, *Viburnum*, *Spiræa aruncus*, rose, apple, and *Cornus alternifolia.* It is recorded from Alabama, Connecticut, California, South Carolina, Delaware, Georgia, New Hampshire, Illinois, Idaho, Indiana, Rhode Island, New Jersey, Kansas, Maryland, Michigan, Maine, Missouri, New York, Nevada, Nebraska, Ohio, Pennsylvania, Tennessee, Vermont, Virginia, West Virginia, Wisconsin, Washington St., and Washington, D. C., on apple, pear, quince, raspberry, currant, hawthorn, buckthorn, linden, hop-tree, bladder-nut, horse-chestnut, maple, water-locust, honeysuckle, ash,elm, hackberry, cottonwood,willow, poplar, prune, birch, *Cornus* sp. and *Cornus californicus*, plum, wild red cherry, wild grape, *spiræa*, fig, and rose bushes. The parasite, *Aphelinus mytilaspidis*, Le B., was reared from scales at Methuen, Mass.

(68) *Mytilaspis citricola*, Pack.; 1870-1897. N.

On orange and lemon, in fruit stores, exposed for sale at Lawrence,

Mass. It is known from California, Colorado, Florida, and Georgia, on orange and lemon.

(69) *Mytilaspis Gloverii*, Pack.; 1869-1897. N.

At Lawrence, Mass., on orange and lemon in fruit stores, and recorded from California, Louisiana, Florida, Georgia, and New York, on orange and lemon.

(70) *Pinnaspis pandani*, Comst.; 1881-1880. I.

At Cambridge Botanic Gardens, coll. by J. W. Folsom, 1898 (Ckll. in litt.). Originally described from Harvard Botanic Garden under the genus *Mytilaspis*.

CORRESPONDENCE.

A CALIFORNIAN TICK.

Sir,—Herewith I send a specimen of an *Arachnide* which looks to me to belong to the genus *Argas*, or so it was called when I was studying that group of *Arthrozoa*.

At the same time, I send you an account of observations upon the effect of the bite of the *Argas*, which observations seem to me to throw some light on the conflicting statements regarding the effect of the bite of the reputed *Argas Persicus*.

From the observations of my correspondent, Mr. R. A. Plaskett, who resides in a district in the Santa Lucia Mountains infested by this very local *Arachnide*, it appears that horses, which animals are generally bitten just above the hoof, seem not to suffer. The *Argas* drinks only from three to five minutes and then drops without leaving a swelling. This is unlike the *Ixodes* and *Trombidium*, which will suck for a day or two, frequently causing swelling and suppuration. These are generally reputed to be the result of methods used in extracting the animal, but they are occasionally observed where the animal has left of its own free will after having satisfied its appetite.

Another peculiar characteristic in the habits of the animal is its dislike of green vegetation. It is always found on the top of dry, leafless twigs or in dust, never amidst foliage, as are *Trombidium* and *Ixodes;* but this part of my friend's observations has to be taken *cum grano salis*, as he is not an experienced entomologist, and amidst green foliage it is

not so easy to discover a dust-coloured insect as when it is isolated on the top of a dry twig, whence it lets itself drop upon the passer-by.

As to the effect of the *Argas* bite on the human species, the symptoms vary as well as the time of suction following the bite. The effect seems to depend chiefly on personal idiosyncrasy, which probably also accounts for the comparative immunities and receptivities reported in reference to the bite of *Acanthia (Cimex) lectularia*, *Reduvius*, and of the different *Tipulides* and *Culicides*. R. A. Plaskett has been bitten twice, and in each case it took about twenty-four hours before fever and swelling set in. The numbness of the bitten parts, which is so characteristic of the bite of *Arachnides*, *Myriopodes*, and of some Hymenopterous stings, was not noticed in a single instance. Now, these observations agree very well with the statements that are in our possession regarding the effects of the bites of other *Argas*, and at the same time they explain the discrepancies in the statements of the effects of the bite of the dreaded *Argas Persicus*, which seems to be as local as our California insect.

The fatal termination in cases where persons have been bitten by *Argas Persicus*, which are mentioned by old Herodotus, and by Pallas in modern times, may have their origin in malarious fevers, which are very common in that district of the Persian Province Ghilan, between the Caspian Sea and the Elbrus Mountains, where the *Argas* is found. The bite of the animal is probably only a coincidence, of course not favourable to the condition of a patient already weakened by malaria. Here in California we have had to face an analogous error with regard to the fatal effects of *Rhus diversiloba*. All the fatal cases were malaria patients, sick for a considerable time before they came in contact with the *Rhus*.

As to the effect of the bite of *Argas Persicus*, even if not fatal, the consequences in some instances must be serious enough to induce the inhabitants of Persian villages to change the location of their settlement, as is mentioned in Kotzebue's report of his travels through Ghilan. At the same time, this change of location as a remedy is another proof of the very local distribution of *Argas Persicus*, a peculiarity shared in common with *Argas Columbæ* of Europe and our own Santa Lucia species.

Our Santa Lucia species seems to be both diurnal and nocturnal. The *Argas Columbæ* of Europe is nocturnal, and in its habits bears a

close resemblance to the common bedbug. The local name of our Californian species is Pajaronela, a word evidently derived from the Spanish Pajaro, a bird, and it would indicate to me a similar manner of living to that of *Argas Columbæ*, were not the statements of Mr. Plaskett, which are founded on repeated observations of this locally very common insect, diametrically opposed to such a supposition.

I hope that the publication of these statements will excite some interest amongst practical students of entomology, and that they may lead to a closer study of those insects which interfere with the well-being of our own race.

It may be that a closer study of the facts will furnish us with data that will explain why the sting of an insect, in some instances producing serious consequences, is in others perfectly harmless. Such data might throw some light on the mysterious play of idiosyncrasies.

H. H. Behr.

The specimen sent by Dr. Behr has been submitted for identification to the United States Entomologist, Dr. Howard, from whose Division the following reply has been received :

"In the absence of Dr. Howard, I have to reply to your letter of the 3rd instant, transmitting a copy of an article by Dr. H. H. Behr, and a specimen of tick for identification. Mr. Banks, our authority on ticks, has examined the specimen in question, and is responsible for the following identification and note :

"'The tick is *Ornithodorus Americanus*, Marx, and probably the same as *O. turicata*, Megnin, from Mexico. Neumann, in his recent revision of the group, uses Megnin's name. It is well known to attack various animals. It is not common in the Southwest. There are four species of Argasids in our country : *Argas Americanus*, Pack.; *A. Sanchezi*, Dugès ; *Ornithodorus Americanus*, Marx, and *O. Megnini*, Dugès. Another species, *A. talajae*, Guerin, may also occur in the region near Mexico.'

"The specimen and manuscript are returned herewith.

"C. L. Marlatt,

"Acting Entomologist."

LUCANUS MASAMA, LEC.

SIR,—I found this evening (28th June, 1899,) a male specimen of *Lucanus Masama* (Lec.), on the ground at the foot of a dead cotton tree. Investigating the place, I noticed several large holes around the tree, and discovered in one of them a pair of beetles, which were evidently intending to mate. At the foot of another cotton tree stump near by, a male was crawling slowly on the ground; another male came flying and alighted, and a short search was rewarded by the discovery of a female, hidden in a hole. Another dead cotton tree yielded three males (two of them crawling and one flying) and one female, at the foot of the tree on the ground.

It seems that the metamorphosis of the larva to the adult Lucanus masama takes place underground, the female probably not leaving the ground; whereas the males fly around in search of the opposite sex. I noticed some large holes in the trees under which the specimens were found, and if these holes were made by the larva of L. masama, then the above ventured hypothesis is wrong, and the females simply hide in the ground, after having completed their metamorphosis in the substance of the tree, and seek the ground possibly for the deposition of their eggs.

I would be greatly obliged to any reader of this notice for the life history of the other N. American species of Lucanus.

A. FENYES, M. D.,
Santa Fè., New Mexico.

ACKNOWLEDGMENT.

SIR,—I desire, on behalf of the Entomological Society of Ontario, to make public acknowledgment of its indebtedness to Mr. C. T. Ramsden, of Santiago de Cuba, for many curious and interesting entomological specimens of various kinds, his own collecting in that now famed locality. A more extended notice may be taken of some of them at a future time. J. ALSTON MOFFAT, Curator.

The Rev. C. J. S. Bethune, editor of this magazine, begs to announce that he has resigned his position as Head Master of Trinity College School, Port Hope, which he has held for the last twenty-nine years, and that his address, after August 24th, will be 500 Dufferin Avenue, London, Ontario.

Mailed August 11th, 1899.

The Canadian Entomologist.

Vol. XXXI. LONDON, SEPTEMBER, 1899. No. 9.

OPHIOGOMPHUS.

BY JAMES G. NEEDHAM, LAKE FOREST, ILL.

This genus of dragon flies is one of the groups whose members are accounted rare in collections, though quite abundant in nature. With the exception of three species, two of which have only been obtained in numbers by breeding, few imagoes have been taken. Although I have collected carefully for several years in localities where a few species were common enough, I have seen but three imagoes at large, but I have bred one species by hundreds, and have seen the exuviæ upon the banks of streams by tens of thousands.

Nymphs of this genus seem to prefer the sandy or gravelly beds of clear, rapid streams, flowing through rocky woods. What becomes of the countless imagoes which issue from such places by night in early summer I have not as yet been able to find out.

So long as the collector of these insects depends entirely upon an air net for his imagoes they are likely to remain rare in his collection; but even a single occasional capture of a good specimen may still add to our knowledge of the genus, since variation is considerable, descriptions are fragmentary, and specimens of most species are few.

This paper is but an excuse for the accompanying plate (5), whose figures are mainly drawn from the types of species and show the structures chiefly used in characterizing them. In its preparation I have had free use of the Hagen collection at Cambridge and of the Lintner collection at Albany—thanks to the kindness of Mr. Henshaw and of Dr. Felt, respectively. This plate and the few annotations on species which follow will serve to bring our species together in one view, and will also indicate the chief gaps in our knowledge of them.

Secondary sexual characters have been mainly used for separating Ophiogomphus from its nearest allies, Onychogomphus (fig. 32) of the Old World, and Herpetogomphus of the western United States and southward. The most salient of the differential characters used for the two American genera have been the form of the inferior abdominal appendage

in the male, and the length of the vulvar lamina in the female. These have proved unsatisfactory, especially for the males (of which more are known), yet without destroying faith in the validity of the two genera as natural groups. I wish to point out that there is a venational character, applicable to both sexes, which seems to segregate these two genera sharply. It is the anal loop (see figs. 31 and 33). In Ophiogomphus (fig. 31) the first and second branches of the anal vein (1 and 2) are approximated near their origin to enclose, together with a cross vein connecting them, a distinct anal loop (*a*) of two to four (normally of



FIG. 31.—OPHIOGOMPHUS.

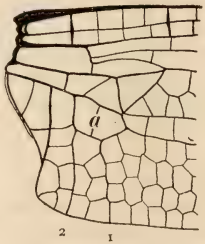


FIG. 32.—ONYCHOGOMPHUS.

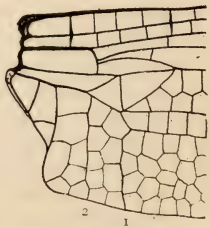


FIG. 33.—HERPETOGOMPHUS.

three) cells. In Herpetogomphus (fig. 33) these veins are not so approximated, and no such semicircular enclosure is formed, but two ordinary cells lie between the veins at their origin.

The genus Ophiogomphus includes, besides four European and Asiatic species, the following thirteen nominal species found in the United States, named in the order of their discovery :

1. O. colubrinus, Selys.—Maine and northward. ♂ and ♀ known.
2. O. rupinsulensis, Walsh.—Eastern U. S. ♂ and ♀ known.
3. O. Mainensis, Packard.—Northeastern U. S. ♂? and ♀ known.
4. O. bison, Selys.—Nevada. ♀ known.
5. O. severus, Hagen.—Colo. ♂ and ♀ known.
6. O. montanus, Selys.—Mont. ♂ known.
7. O. Morrisoni, Selys.—Nev. ♂ and ♀ known.
8. O. occidentis, Hagen.*—Wash. ♂ and ♀ known.
9. O. Carolinus, Hagen.*—N. Car., Ky.? ♂ and ♀ known.
10. O. aspersus, Morse.—♂ and ♀ known.

*Imago undescribed.

11. O. Johannus, Needham.—N. Y. ♂ known.
12. O. Carolus, Needham.—N. Y. ♂ and ♀ known.
13. O. anomalus, Harvey.—Maine. ♂ known.

STRAY NOTES ON SOME OF THE SPECIES.

O. anomalus, Harvey (Ent. News, IX., 60. ♂. Pl. V., fig. 1.), is like Herpetogomphus in the form of the terminal abdominal appendages of the male. I have before me the hind wing of the type (which Professor Harvey has kindly sent me), and the anal loop is of the typical semicircular three-celled form of Ophiogomphus.

O. Colubrinus, Selys, is the most sharply marked species of the genus. It is like the preceding in the generally darker coloration of the body and in having the face transversely lineate with black, but it is unlike all the others in extreme length of the inferior abdominal appendage in the male, and in the straightness of the lobes of the vulvar lamina in the female (Pl. 5, figs. 7 and 34).

O. Johannus, Ndhm., and *O. Carolinus*, Hag., are distinguished by a second bifurcation of the inferior abdominal appendage in the male. The figures of *O. Johannus*, drawn from the type, which was a somewhat imperfect specimen and apparently not quite mature, may not fully represent the species; but the tips of the appendages and the genital hamules were at least well developed (figs. 9, 18 and 27 of Plate 5). The thicker parts of appendages are subject to some distortion in drying in immature specimens. As to *O. Carolinus*, Hag., the types are in the Hagen collection at Cambridge, undescribed; but a female nymph skin from Bee Spring, Ky., Hagen has described and referred by supposition to this species (Trans. Amer. Ent. Soc., XII., 258, 1885). This is especially unfortunate, because the nymphs in this genus are well-nigh undeterminable. If now the Kentucky nymphs should yield another species of imago—a thing entirely possible—there would be synonymic confusion of a rather unique sort. With small likelihood of settling the question of the correctness of Hagen's supposition as to the nymph, it would seem best to regard the name as rightfully belonging to the imagoes from N. Carolina to which it was originally applied, and the types fixed by the figures herewith presented (figs. 8, 17, 26 and 35 of Plate 5).

O. Mainensis, Pack. (Proc. Ac. Nat. Sci., Phila., 1863, p. 255), and *O. Carolus*, Ndhm. (Can. Ent., XXIX, 183, 1897), are very closely allied, perhaps identical. If the males in the Hagen collection were the types I should unhesitatingly pronounce *O. Carolus* a synonym. But the

original female type there preserved is very different from any females of *O. Carolus* I have seen, especially in the form of the occiput (see Plate 5, figs. 10 and 19). The occiput is variable, to be sure, but I have shown the full extent of variability exhibited by a very large series of females of *O. Carolus* in these pages (Can. Ent., XXIX, Pl. 7, figs. 1–4), and have found nothing approximating the conformation of the type *O. Mainensis*. Since it is possible that the males associated with this female type may not belong with it, one must show before uniting the species either that the normal variation of the occiput includes such forms, or else that the female type is a freak. The specimens in the Lintner collection, determined by Hagen as *O. Mainensis*, agree entirely (both males and females) with *O. Carolus*.

Of the three closely allied far-western species, *O. severus*, Hag., *O. montanus*, Sel., and *O. Morrisoni*, Sel., I have seen very few specimens: of *montanus*, none at all. *Montanus* was first described as a variety of *O. severus*, but was ranked as a species by De Selys in his Revision des Ophiogomphus (C. R. Ento. Soc. Belg., 1879, p. lxiv.), and so listed by Kirby in his Catalogue of the Odonta. These three species constitute a group within the genus characterized by De Selys by the simple (hornless) occiput of the female—a thing not distinctive, as we have seen, but apparently entirely characteristic of these species.

The remaining species constitute a troublesome lot, among which *O. aspersus*, Morse, seems pretty sharply defined; but variation in the form of the accessory genitalia is very considerable. Only two of the species, *O. rupinsulensis* and *O. occidentis*, are known from more than a few specimens. The figures herewith given for these two species seem distinct enough, yet the specimens in the Hagen collection show them to intergrade almost completely. *O. bison* was dropped by De Selys from the list given in his Revision *(op. cit.)*—whether intentionally or not, I do not know—but the female in the Hagen collection is certainly very much like O. rupinsulensis. (See Plate 5, fig. 32.) I desire at this point to correct a very serious error of my own: Misled by the upturned inferior appendages of the male, and having too great faith in the constancy of genital characters, I described as Herpetogomphus pictus (Can. Ent., XXIX., 181, 1897), some exceptionally finely coloured males of *O. rupinsulensis*. Since studying a large series, I do not retain the name even for a reliable variety.

I figure here for O. occidentis (Pl. 5, figs. 4, 13 and 22), the bred specimen in the Hagen collection, which must be considered the type, since its cast skin is described (Trans. Amer. Ent. Soc., XII., 259).



PLATE 5.—STRUCTURAL DETAILS OF OPHIOGOMPHUS.

OPHIGOMPHUS.

Explanations of Plate 5.

Figs. 1 and 28—O. Carolus, Ndhm.
Figs. 10, 19 and 36—O. Mainensis, Pack.
Figs. 2, 11, 20 and 29—O. aspersus, Morse.
Figs 3, 12, 21, 30 and 31—O. rupinsulensis, Walsh.
Figs. 4, 13 and 22—O. occidentis, Hag.
Figs. 5, 14 and 23—O. Morrisoni, Sel.
Fig. 32—O. bison, Sel.
Figs 6, 15, 24 and 33—O. severus, Hag.
Figs. 7, 16, 25 and 34—O. colubrinus, Sel.
Figs. 8, 17, 26 and 35—O. Carolinus, Hag.
Figs 9, 18 and 27—O. Johannus, Ndhm.

The figures in the first column represent lateral views of the terminal abdominal appendages of the males; those in the second column, dorsal views of the same; those in the third column, the genital hamules of the males, inverted and viewed from the side; those in the fourth column, vulvar lamina of females upon the sternum of the 9th abdominal segment: — *excepting* figs. 10, front, and 19, oblique fronto-lateral views of the occipital process of the female type of O. Mainensis; fig. 26, ventral view of male abdominal appendages; and fig. 31, dorsal view of the head of O. rupinsulensis, showing the curious post-ocular tubercles: *e*, eye; *f*, frons.

CLASSIFICATION OF THE ENTOMOPHILOUS WASPS, OR THE SUPERFAMILY SPHEGOIDEA.

BY WILLIAM H. ASHMEAD, ASSISTANT CURATOR, DIVISION OF INSECTS, U. S. NATIONAL MUSEUM.

(Paper No. 4.)

Family XVIII.—Bembicidæ.

The sessile abdomen, always without a constriction between the first and second segments, but above all the very large, free, triangularly elongated labrum, which is always much longer than wide at base, the sinuate or ♂-shaped transverse median nervure in the hind wings, and the aborted ocelli, at once distinguished the family.

Most authorities have confused, or at least included this family with the family Stizidæ, which also has a more or less prominent labrum; but in the Stizidæ the ocelli are *always* distinct, normal, the labrum is most

frequently semicircular, always wider than long, while the middle tibiæ have *two* distinct apical spurs, characters of great taxonomic value, readily recognizable, and which at once separate them from the Bembicidæ.

The genera are not numerous, and may be separated as follows:

Table of Genera.

Anterior ocellar cicatrice elliptic, round or reniform.....2.
Anterior ocellar cicatrice linear, transversely arcuate.
Metathorax excavated posteriorly, compressed laterally; last ventral segment in ♂ ending in 3 spines; mandibles dentate; maxillary palpi 6-, labial palpi 4-jointed.....Bembidula, Burm.
Metathorax flat or convex posteriorly, not compressed laterally; last ventral segment in ♂ ending in a single spine.
Mandibles dentate; maxillary palpi 4-, labial palpi 2-jointed.....Bembex, Fabr.
Mandibles edentate; maxillary palpi 3-, labial palpi 1-jointed.....Microbembex, Patton.
2. Front ocellar cicatrice round or reniform; maxilla short; maxillary palpi 6-, labial palpi 4-jointed.....Monedula, Latr.
Front ocellar cicatrice elliptic; maxilla long, attaining the hind coxæ; maxillary palpi 3-, labial palpi 1-jointed.....Steniola, Say.

North American Species.

(1) Bembidula, Burmeister.
(1) B. variegata, Olis.
(2) B. quadrifasciata, Say.
(3) B. insidiatrix, Hdl.
(4) B. parata, Prov.
(5) B. capnoptera, Hdl.
var. mesillensis, Ckll.
(6) B. fodiens, Hdl.
(7) B. diodenta, Handl.
(8) B. decisa, Taschaub.
(9) B. viduata, Handl.
(10) B. Burmeisteri, Handl.
(2) Bembex, Fabricins.
(1) B. amoena, Hdl.
(2) B. Belfragei, Cr.
=(Cressoni, Hdl.)
(3) B. insignis, Hdl.
=Belfragei, Cr., pars.
(4) B. spinolæ, Lepel.
(=fasciatus, Auct.)
(5) B. similans, Fox.
(6) B. Sayi, Cr.
(7) B. texana, Cr.
(8) B. troglodytes, Hdl.
(9) B. convexus, Fox.
(10) B. cinerea, Hdl.
(11) B. nubilipennis, Cr.
(12) B. pruinosa, Fox.
(13) B. occidentalis, Fox.
(14) B. u-scripta, Fox.
(15) B. multipicta, Smith.
(16) B. pallidipicta, Smith.

(17) B. mimas, Handl.

MIEROBEMBEX, Patton.

(1) M. monodonta, Say.

(3) MONEDULA, Latreille.

(1) M. signata, Linn, ♀ ♂.

(2) M. carolin, Fabr., ♀ ♂.

(3) M. spinosa, Cr.
=formosa, Cr.

(4) M. serrata, Hdl.

(5) M. pulchella, Hdl.
=minatula, Hdl.

(6) M. tuberculata, Fox.

(7) M. plana, Fox.

(8) M. emarginata, Cr.

(9) M. femorata, Fox.

(10) M. pictifrons, Smith.

(11) M. tenuicornis, Fox.

(12) M. scitula, Fox.

(13) M. exiqua, Fox.

(14) M. villosa, Fox.
= mamillata, Fox nec Hedl.

(15) M. usetata, Fox.

(16) M. pulla, Hdl.

(17) M. nigrifrons, Prov.

(18) M. heros, Fabr., ♀ ♂.

(19) M. surinamensis, De Geer, ♀.

(20) M. maculata, Fabr., ♀ ♂.

(21) M. punctata, Fabr., ♀ ♂.

(22) M. dives, Handl.

(23) M. mexicana, Handl.

(4) STENIOLIA, Say.

(1) S. duplicata, Say.
=scolopacea, Handl.

(2) S. obliqua, Cr.

(3) S. tibialis, Hdl.

(4) S. longirostra, Say.

FAMILY XIX.—Larridæ.

This family seems to be closely allied to the family Bembicidæ, but is readily separated from it by the *small*, not free, labrum, which is usually completely hidden under the clypeus; the ocelli are distinct or, at most, with only the hind ocelli aborted or represented by cicatrices; the front wings have always a distinct stigma, while the cubitus in the hind wings originates most frequently beyond the transverse median nervure, the latter being straight, or at least never *c*-shaped.

The family is a most extensive one, and widely distributed into all quarters of the globe, the temperate regions being especially rich in genera and species.

Four distinct groups have been recognized, which I designate as subfamilies, distinguishable as follows:

Table of Subfamilies.

Hind ocelli normal, distinct.....2.

Hind ocelli more or less distorted, obsolete or subobsolete, or indicated by cicatrices; mandibles most frequently emarginate on under side.....Subfamily I., Larrinæ.

2. Second cubital cell never petiolate, receiving both recurrent nervures, or the first and second submarginal cells each receive a recurrent nervure; pronotum long.....Subfamily II., Lyrodinæ.
Second cubital cell petiolate or triangular, or more rarely entirely wanting; pronotum most frequently short, transverse.
Front wings with one or two cubital cells, or with none; pygidial area wanting.....Subfamily III., Nitelinæ.
Front wings with two or three cubital cells; pygidial area present; marginal cell most frequently, but not always, truncate, with an appendage.....Subfamily IV., Pisoninæ.

SUBFAMILY I.—Larrinæ.

The aborted hind ocelli, represented at the most by cicatrices, readily separate this subfamily from the others.

The table of genera, which follows, is almost a literal translation from Dr. Franz Kohl.

Table of Genera.

Anal lobe of hind wings very large and extending to or beyond the apex of the submedian cell; third cubital cell, along the radius, shorter than along the cubitus; mandibles most frequently emarginate beneath.....2.
Anal lobe of hind wings much shorter, *not* extending to the apex of the submedian cell; third cubital cell, along the radius, as long or longer than along the cubitus; second cubital cell triangular or petiolate, receiving both recurrent nervures, or the second recurrent is interstitial; abdomen with the segments depressed at apex as in *Cerceris;* pygidial area sharply defined in both sexes.....Palarus, Latreille.
2. Eyes in ♂ *not* converging and meeting above as in *Astatus;* first and second dorsal abdominal segments with an acute margin laterally; ventral segments 6–7 free, 2–5 exhibiting in part prominent transverse swellings; marginal cell short, very broadly truncate; third transverse cubitus uniting with radius a little before the truncature; tarsal comb developed. ♂. (♀ unknown.)..Homogambrus, Kohl.
3. First abdominal segment not strikingly elongate.....4.
First abdominal segment elongate, longer than the widest part, narrower towards base, imperfectly petioliform.
Face *without* a trace of swelling or longitudinal fold along the inner eye margin, usually with a rounded central swelling on the upper part of the vertex; pronotum lying deeply beneath

the apex of the mesonotum ; clypeus with 4 median teeth anteriorly ; pygidium bare ; hind tibiæ without special characters, the tarsi of usual length, the basal joint hardly half as long as the tibiæ ; comb of front tarsi short. (♂ unknown.) Parapiagetia, Kohl.

Face with slight, blister-like swellings in the middle appearing as a strong transverse swelling ; no swelling on the upper frontal part; the hind ocelli lying in a flat basis ; pronotum only slightly impressed beneath the apex of the mesonotum, the collar long ; metanotum as long, or nearly, as wide ; pygidial area almost bare, with small bristles only at apex ; hind femora at basal third beneath emarginate and with a tooth, often only with a blunt process ; tarsi elongate, the basal joint of hind tarsi very distinctly longer than half the length of the tibiæ ; teeth of front tarsal comb weak, short and slender. Piagetia, Ritsema.

4. Face *without* a swelling or fold along the inner eye margin ; pronotum more or less deeply impressed beneath the apex of the mesonotum ; metanotum usually shorter than the mesonotum ; claws simple ; mandibles emarginate beneath 11.

Face *with* a swelling or fold along the inner eye margin 5.

5. Second cubital cell not petiolate, always sessile 6.

Second cubital cell petiolate ; mandibles *without* a tooth within, emarginate beneath on outer side ; front tibiæ on outer side spinous ; pygidial area bare, with the sides converging posteriorly ; legs, especially the femora, stout ; hind tibiæ not ridged ; ventral plate of second segment without swelling Larraxena, Smith.

6. Mandibles *with* an emargination on under side 8.

Mandibles *without* an emargination on under side ; pronotum impressed beneath the apex of the mesonotum, especially laterally ; claws unusually long, simple 7.

7. Mandibles with a subbasal tooth and a strong subapical tooth within (♀) ; hind margins of the dorsal abdominal segments distinctly depressed ; pygidial area (♀) and the dorsal plate with very distinct scattered punctures, appearing (without taking into account the scattered erect hairs) bare and shining ; hind tibiæ not ridged ; front tibiæ outwardly not spinous ; body and legs with long hairs Paraliris, Kohl.

Mandibles within, not far from the base, with one tooth in ♂, with two teeth in ♀ ; in the latter case the second tooth is distinctly

smaller than the first; no subapical tooth within; hind margins of dorsal abdominal segments *not* distinctly depressed; pygidial area in ♀ clothed with shorter hair and stiff bristles towards apex; dorsal segments thickly tomentose, or at least with a fine pubescence; metanotum not emarginate behind; hind tibiæ longly ridged behind; front tibiæ outwardly usually spinous.....Liris, Fabr.

8. Mandibles *without* a tooth within; pygidial area in ♀ bare, *without* stiff bristles, at most with a very fine pubescence at apex only; hind tibiæ behind not ridged, or the ridge scarcely indicated. 10.

Mandibles *with* one or two teeth within before the middle, near the base; pygidial area with stiff bristles, usually indistinct at apex; lateral margins of the pygidium convergent behind; front tarsal comb with stiff spines.....9.

9. Metanotum longer than the mesonotum; pygidial area clothed with a silvery pubescence; anterior femora in ♂ *not* marginate near the base.....Notogonia, Costa.

Metanotum shorter than the mesonotum; pygidial area bare towards the base, but with short, stiff hairs at apex; anterior femora in ♂ emarginate near the base.....Ancistromma, Fox.

10. Claws *not* unusually long, simple; front femora either toothed or simple; lateral ridges of the pygidial area (♀) feebly curved, not distinctly convergent; ventral plate of the second abdominal segment without deplanate places; punctuation of the head and thorax distinct, proportionately not fine; abdomen in ♂ usually densely punctured, with or without a pygidial area; mesosternal suture wanting.....Larra, Fabr.

Claws unusually long, with a median tooth; pronotum only slightly impressed beneath the apex of the mesonotum, more towards the sides than medially; front femora without a tooth; pygidial area with the lateral margins parallel or, in only a few cases, convergent posteriorly; ventral plate of the second abdominal segment with two deplanated places at the base, which are separated by a keel-like elevation; abdomen in ♀ shining, with the margin of the segments slightly tomentose; legs rather stout; ♂ with the claws simple, the mesosternal suture distinct posteriorly....Motes, Kohl.

11. Face medially *without* a swelling, at the most with two small tubercles above the base of the antennæ; legs unusually stout; abdomen not coarsely punctured; second dorsal segments not margined at sides.....12.

Face medially *with* a well defined, rounded, smooth, shining swelling, placed at an equal distance between the front ocellus and the base of the antennæ; epicnemia of mesepisternum distinct; front femora in ♂ without an emargination; tarsal comb in ♀ composed of very long flexible bristles; abdomen very coarsely punctured; second dorsal segment sharply margined at sides; pygidial area in both sexes bare..... Prosopigastra, Costa.

12. Pygidial area clothed with short, stiff bristles; hind ocellar cicatrices linear, hooklike; tarsal comb in ♀ with rather short spines; front femora in ♂ either simple or emarginate near base beneath..... ...Tachytes, Panzer.

Pygidial area bare; hind ocellar cicatrices oval; tarsal comb in ♀ with long, flexible spines..... Tachysphex, Kohl.

SUBFAMILY II.—Lyrodinæ.

In this subfamily the ocelli are always distinct, normal, never aborted, the pronotum usually long, while the second cubital cell is never petiolate or triangular.

The distinct ocelli easily separate the group from the Larrinæ, while the venation of the front wings and the longer pronotum separate it from the Nitelinæ and the Pisoninæ.

The known genera may be recognized with the aid of the following table:

Table of Genera.

Marginal cell at apex truncate, or rarely rounded, but always *with* a more or less distinct appendage; two or three cubital cells..... 2.

Marginal cell lanceolate, *without* an appendage; three cubital cells.

Submedian cell shorter than the median, the second cubital cell receiving both recurrent nervures, the second recurrent entering it very close to the apex; eyes convergent above; mandibles not excised beneath..... Heliocausus, Kohl.

Submedian cell a little longer than the median, the second cubital cell receiving only one recurrent nervure at or near its middle, the first recurrent nervure received by the first cubital cell near its apex; eyes only slightly convergent above; mandibles deeply excised beneath; cubitus in hind wings originating far beyond the transverse median nervure..... Zoyphium, Kohl.

2. Front wings with two cubital cells..... 4.

Front wings with three cubital cells.

Second cubital cell receiving both recurrent nervures.....3.
Second cubital cell receiving only one recurrent nervure—the second, the first recurrent nervure received by the first cubital cell near its apex.

Transverse median nervure interstitial with the basal nervure, or uniting with the median vein a little before it; cubitus in hind wings originating *beyond* the transverse median nervure; eyes somewhat convergent above; mandibles excised beneath beyond the middle.....Sericophorus, Smith.
=Tachyrhostrus, Sauss.

3. Transverse median nervure interstitial with the basal nervure; cubitus in hind wings originating somewhat *beyond* the transverse median nervure; collar long; eyes parallel; mandibles strongly excised beneath.....Lyroda, Say.
Transverse median nervure uniting with the median nervure *before* the origin of the basal nervure; cubitus in hind wings originating much *before* the transverse median nervure.

Eyes submarginate within, convergent above; clypeus transverse, the anterior margin arcuate; mandibles at apex acute, unarmed; beneath excised beyond the middle.....Laphyragogus, Kohl.
Eyes not at all emarginate within, strongly convergent above; clypeus large; mandibles excised beneath with two blunt teeth on inner margin.....Leianthrena, Bingham.

4. Submedian cell much shorter than the median; second cubital cell receiving both recurrent nervures; cubitus in hind wings originating beyond the transverse median nervure.....Gastrosericus, Spinola.

Subfamily III.—Nitelinæ.

In this group the ocelli are also distinct, but the venation of the front wings is quite distinct from the Lyrodinæ, while the pronotum is shorter, transverse. From the Pisoninæ it is also distinguished by venation, and by having *no* pygidial area.

The genera falling in this group are distinguished as follows:

Table of Genera.

Front wings *with* a marginal cell.....2.
Front wings *without* a marginal cell.

Cubital and discoidal cells wanting, the cubital vein alone present, but much abbreviated; eyes slightly convergent above; mandibles excised beneath Miscophoides, Brauns.

2. Front wings with two recurrent nervures..... 4.
Front wings with only one recurrent nervure.
With two cubital cells..... 3.
With only one cubital cell; submedian cell in both wings much shorter than the median.
Marginal cell large, longer than the first cubital cell, subtruncate at apex, with a slight appendage; mandibles acute, *not* excised beneath..... Nitela, Latreille.
Marginal cell rather small, much shorter than the first cubital cell, somewhat rounded at apex, without an appendage; mandibles acute, but excised beneath..... Nitelopterus, Ashm.

3. Wings abbreviated, the stigma not developed; marginal cell small, triangular; cubital cell very large, rhomboidal; collar well developed, as long as the metathorax, narrowed anteriorly; mandibles deeply excised beneath, pointed at apex, without teeth within Saliostethus, Brauns.
Wings normal, the stigma small but distinct; marginal cell as in *Miscophus;* submedian cell shorter than the median; eyes large, extending to base of mandibles, and only slightly convergent above; mandibles beneath deeply excised from a little before the basal half to apex; antennæ filiform, slightly tapering off towards apex; clypeus not separated from the face by a suture; occiput with a transverse furrow between the occipital margin and the base of the vertex; metathorax fully as long as the mesonotum, with a delicate median carina..... Miscophinus, Ashm.
[=Hypomiscophus, Ckll.]

4. Marginal cell without an appendage at apex; second cubital cell receiving the second recurrent nervure towards apex; cubitus in hind wings originating far beyond the transverse median nervure; eyes convergent above Miscophus, Jurine.

Subfamily IV.—Pisoninæ.

In this group the front wings have two or three cubital cells, the second always triangular and most frequenly petiolate; the eyes are often emarginate within; the ocelli distinct; while the pygidium in the females always has a distinct pygidial area.

The group is very closely allied to the *Miscophinæ*, the only reliable character to distinguish it being the distinct pygidial area, although, as a rule, the tibial spurs and the pronotum are shorter than in the latter group.

Thirteen genera have been recognized, distinguished as follows:

Table of Genera.

Marginal cell at apex truncate or rounded, with an appendage.....3.

Marginal cell lanceolate, not truncate at apex, or at most narrowly rounded, without an appendage.

Front wings with three cubital cells.....2.

Front wings with two cubital cells, each receiving a recurrent nervure.

Transverse median nervure *interstitial* with the basal nervure.....Taranga, Kirby.

Transverse median nervure *not* interstital joining the median vein *before* the origin of the basal nervure.....Parapison, Smith.

2. Transverse median *not* interstitial joining the median vein *before* the origin of the basal nervure.

Second cubital cell larger, more briefly petiolate, receiving both recurrent nervures, or the first recurrent nervure is interstitial with the *first* transverse cubitus; mandibles excised beneath; eyes only slightly emarginate within...Pisonopsis, Fox.

Second cubital cell small, longly petiolate, receiving one or both recurrent nervures, or the second is interstitial with the second transverse cubitus: mandibles *not* excised beneath.

Second cubital cell receiving both recurrent nervures, or the second recurrent is interstitial with the second transverse cubitus.....Pison, Spinola.

Second cubital cell receiving only one recurrent nervure —the second, the first recurrent nervure received by the first cubital cell a little *before* the first transverse cubitus.....Pisonitus, Shuckard.

Transverse median nervure interstitial, the second cubital cell triangular, receiving the second recurrent nervure near its apex, the first recurrent nervure interstitial with the first transverse cubitus; cubitus in hind wings originating *beyond* the transverse median nervure; hind femora much thickened towards apex, especially in the ♀, roughened and serrated on outer face.....Bothynostethus, Kohl.

3. Second cubital cell receiving only one recurrent nervure 4.
Second cubital cell receiving both recurrent nervures, or the first is interstitial with the first transverse cubitus.
Submedian cell shorter than the median; cubitus in hind wings originating *beyond* the transverse median nervure; eyes within nearly parallel; mandibles excised beneath..Sphodrotes, Kohl.
Submedian and median cells equal or nearly, the transverse median nervure being interstitial or nearly, with the basal nervure; cubitus in hind wings originating *beyond* the transverse median nervure; eyes convergent above; mandibles excised or sinuate beneath.
Hind tibiæ smooth, not serrate.....Niteliopsis, Saunders.
Hind tibiæ strongly serrate and also spinose; mandibles with a deep emargination beneath; clypeus transverse, truncate and with a transverse impression along the anterior margin; hind coxæ normal, without a spine or tubercle....(Africa).
Pseudoheliorycteş, Ashm., n. g.
(Type P. Foxii, Ashm.*)
Submedian cell a little longer than the median; cubitus in hind wings originating *before* the transverse median nervure; eyes more or less divergent above; mandibles beneath with a deep incision before the middle.....Scapheutes, Handl.
4. Second cubital cell receiving the second recurrent nervure at the extreme apex, being almost interstitial with the second transverse cubitus.....5.
Second cubital cell receiving the second recurrent nervure at or near the middle.
Transverse median nervure interstitial with the basal nervure or nearly; first recurrent nervure *interstitial* with the first transverse cubitus.....Solierella, Spinola.
Transverse median nervure *not* interstitial, joining the median vein a little *beyond* the origin of the basal nervure; first recurrent nervure *not* interstitial with the first transverse cubitus.....Sylaon, Picciola.

* Pseudoheliorycteş? Foxii, n. sp.
= Helioryctes melanopygus, Fox nec Smith, Proc. Acad. Nat. Sc., Phil., 1896, p. 554.
Female.—Length, 14 mm. Head, thorax, antennæ, and all coxæ and trochanters, black; rest of legs and the abdomen, except the pygidium above (which is dusky), ferruginous; wings fuscous black.

5. Submedian cell somewhat shorter than the median; cubitus in hind wings originating *far* beyond the transverse median nervure; anterior tarsi in ♀ with a comb; tibiæ spinous; eyes large, convergent above..... Plenoculus, Fox.

North American Species.

Subfamily I.—*Larrinæ.*

(1) PALARUS, Latreille.
(2) HOMOGAMBRUS, Kohl.
(3) PARAPIAGETIA, Kohl.
(4) PIAGETIA, Ritsema.
(5) LARREXENA, Smith.
(6) PARALIRIS, Kohl.
(7) LIRIS, Fabr.
(8) NOTOGONIA, Costa.
 (1) N. argentata, Beauv., ♀ ♂.
 (2) N. nigripennis, Fox, ♀.
 (3) N. aequalis, Fox.
 (4) N. violaceipennis, Cam., ♀.
 (5) N. montezuma, Cam., ♀.
 (6) N. Championi, Cam., ♀.
 (7) N. truncata, Cam.
 (8) N. argentifrons, Cam.
 (9) N. beata, Cam., ♂.
 (10) N. chrysura, Cam., ♂.
 (11) N. argenticauda, Cam., ♂.
 (12) N. apicipennis, Cam., ♂.
 (13) N. panamensis, Cam., ♂.
(9) ANCISTROMMA, Fox.
 (1) A. aurantia, Fox.
 (2) A. copax, Fox.
 (3) A. distincta, Smith.
 (4) A. dolosa, Fox.
 (5) A. tenuicornis, Smith.
 (6) A. discreta, Fox.
 (7) A. conferta, Fox.
 (8) A. divisa, Patt.
 (9) A. consimilis, Fox.
 (10) A. rugosa, Fox.
 (11) A. vegeta, Fox.
 (12) ? A. canescens, Smith, ♀ (Larra).
 (13) ? A. arcuata, Smith, ♀ (Larra).
 (14) ? A. vinulenta, Cr.
(10) LARRA, Fabr.
 (1) L. analis, Fabr.
 (2) L. Cressonii, Fox.
 (3) L. Godmani, Cam., ♀.
 (4) L. rubritarsis, Cam., ♂.
 (5) L. sonorensis, Cam., ♀.
 (6) ? L. rufipes, Prov.
 (7) L. interpennis, Cr., ♀ ♂.
 (8) L. rufipennis, Fabr., ♀ ♂.
(11) MOTES, Kohl.
 (1) M. fulviventris, Guer.
 (2) M. splendens, Ashm.
(12) PROSOPIGASTRA, Costa.
(13) TACHYTES, Panzer.
 (1) T. validus, Cr.
 (2) T. mandibularis, Patt., ♀.
 (3) T. harpax, Patt., ♂.
 (4) T. calcaratus, Fox, ♂.
 (5) T. exornatus, Fox, ♀.
 (6) T. breviventris, Cr., ♀.
 (7) T. praedator, Fox.
 (8) T. columbiæ, Fox.
 (9) T. crassus, Patt.
 (10) T. pepticus, Say.
 (11) T. fulviventris, Cr.
 (12) T. spatulatus, Fox.

(13) T. aurulentus, Fabr.
(14) T. contractus, Fox.
(15) T. distinctus, Smith.
(16) T. elongatus, Cr.
(17) T. sericatus, Cr.
(18) T. rufofasciatus, Cr.
(19) T. abdominalis, Say, ♀.
(20) T. obscurus, Cr., ♀.
= texanus, Cr., ♂.
(21) T. parvus, Fox.
(22) T. abductus, Fox,
(23) T. mergus, Fox.
(24) T. dives, Lepel.
(25) T. yucatensis, Cam., ♀.
(26) T. gautemalensis, Cam., ♀.
(27) T. andreniformis, Cam.
(28) T. argentipes, Cam.
(29) T. ornatipes, Cam.
(30) T. ferrugineipes, Cam., ♂.

(14) TACHYSPHEX, Kohl.
(1) T. Ashmeadii, Fox, ♀.
(2) T. Belfragii, Cr., ♀.
(3) T. spinosus, Fox, ♀.
(4) T. posterus, Fox, ♀.
(5) T. tarsatus, Say, ♀ ♂.
(6) T. texanus, Cr., ♀ ♂.
(7) T. pissatus, Fox, ♂.
(8) T. dubius, Fox, ♂.
(9) T. semirufus, G., ♀.
(10) T. asperatus, Fox, ♀.
(11) T. antennatus, Fox, ♀.
(12) T. parvulus, Cr., ♂.
(13) T. fuscipennis, Fox, ♀.
(14) T. fusus, Fox, ♀ ♂.
(15) T. terminatus, Smith, ♀ ♂.
(16) T. apicalis, Fox, ♀ ♂.
(17) T. acutus, Patt.
(18) T. amplus, Fox, ♀ ♂.
(19) T. montanus, Cr.
(20) T. decorus, Fox, ♀.
(21) T. inusitatus, Fox, ♂.
(22) T. excatus, Fox, ♀.
(23) T. consimilis, Fox, ♀ ♂.
(24) T. quebecensis, Prov., ♀ ♂.
(25) T. compactus, Fox, ♂.
(26) T. triquitrus, Fox, ♀.
(27) T. aethiops, Cr., ♀ ♂.
(28) T. nigrior, Fox, ♀ ♂.
(29) T. pauxillus, Fox, ♀ ♂.
(30) T. punctifrons, Fox, ♀ ♂.
(31) T. mundus, Fox, ♀.
(32) T. minimus, Fox.
(33) T. psilocerus, Kohl.
(34) T. rufomaculatus, Cam., ♀.
(35) ? T. laevifrons, Smith (Larra).
(36) ? T. pennsylvanicus, Beauv. (Larra).

Subfamily II.—*Lyrodinæ.*

(15) HELIOCAUSUS, Kohl.
(16) ZOYPHIUM, Kohl.
(17) SERICOPHORUS, Smith.
(18) LYRODA, Say.
(1) L. triloba, Say.
(2) L. subita, Say.
(19) LAPHYRAGOGUS, Kohl
(20) LEIANTHRENA, Bingham.
(21) GASTROSERICUS, Spinola.

Subfamily III.—*Nitelinæ.*

(22) MISCOPHOIDES, Brauns.
(23) NITELA, Latreille.
(24) NITELOPTERUS, Ashmead.
(1) N. slossonæ, Ashm.
(25) SALIOSTETHUS, Brauns.
(26) MISCOPHINUS, Ashmead.
= Hypomiscophus, Ckll.
(1) M. laticeps, Ashm.

(2) M. californicus, Ashm.
(3) M. texanus, Ashm.
(4) M. arenarum, Ckll.
(27) Miscophus, Jurine.
(1) M. americanus, Fox, ♀ ♂.
Subfamily IV. — *Pisoninæ.*
(28) Taranga, Kirby.
(29) Parapison, Smith.
(30) Pisonopsis, Smith.
(1) P. clypeata, Fox, ♀ ♂.
(2) P. triangularis, Ashm., ♀.
(31) Pison, Spinola.
(1) P. laevis, Smith.
(2) P. conformis, Smith.
(3) P. fasciatum, Kohl.
(32) Pisonitus, Shuckard.
(33) Bothynostethus, Kohl.
(1) B. distinctus, Fox, ♀ ♂.
(2) B. Saussurei, Kohl.
(34) Sphodrotes, Kohl.
(35) Niteliopsis, Saunders.
(1) N. inermis, Cr.
(2) N. plenoculoides, Fox.
(3) N. striatipes, Ashm., ♀.
(36) Pseudoheliorvctes, Ashmead.
(37) Scapheutes, Handlirsch.
(38) Solierella, Spinola.
(39) Sylaon, Picciola.
(40) Plenoculus, Fox.
(1) P. Davisii, Fox.
(2) P. propinquus, Fox.
(3) P. punctatus, Ashm.
(4) P. Cockerellii, Ashm.
(5) P. abdominalis, Ashm.
(6) P. niger, Ashm.
(7) P. Peckhami, Ashm.
(8) P. albipes, Ashm.

CONTRIBUTIONS TO THE KNOWLEDGE OF MASSACHUSETTS COCCIDÆ.—IV.

BY GEO. B. KING, LAWRENCE, MASS.

Diaspinæ (concluded).

(71) *Chionaspis furfurus*, Fitch; 1856–1869. N.

A very common species in Massachusetts, recorded from Amherst, Worcester, Andover, Lawrence, and Methuen, on wild red cherry, pear, wild and cultivated apple, flowering quince, choke-berry, shad-bush, and black alder. It is known from Virginia, Maryland, Pennsylvania, Illinois, Indiana, West Virginia, North Carolina, Ohio, New York, Kentucky, Rhode Island, Connecticut, Georgia, Utah, Kansas, New Jersey, and Washington, D. C., on choke-cherry, wild red cherry, wild and cultivated apple, crab apple, pear, peach, Japan quince, cherry currant, red flowering currant, and European mountain ash.

(72) *Chionaspis furfurus*, var. fulva, King; 1899–1898. N.

Found at Lawrence, Mass., on buckthorn, *Rhamnus catharticus*, L.

(73) *Chionaspis spartinæ*, Comst.; 1883. N.

On salt marsh grass, at Woods Holl, Mass. Coll. Prof. Trelease.

(74) *Chionaspis Lintneri*, Comst.; 1883–1898. I.

An abundant species at Stoneham, Ballardvale, Andover, North Andover, and Methuen, Mass., on Alnus, *Benzoin odoriferum*, *Corylus americana* and *Amelanchier canadensis*. Described from New York.

(75) *Chionaspis pinifoliæ*, Fitch; 1855–1895. N.

Mr. R. A. Cooley (in litt.) informs me that he has found this species common at Reading and Amherst, Mass., and has known it to occur in this State for at least four years. How much longer, it is impossible to tell, as there is no references to its occurrence in literature. I did not find it until May 30th of this year, at Methuen, Mass., on our native hard pine, *Pinus rigida*. It has been recorded from Maine, New York, Ohio, Colorado, New Mexico, Michigan, Missouri, and Illinois.

(76) *Ischnaspis longirostris*, Sign.; 1882–1898. I.

Collected by Mr. J. W. Folsom at the Botanic Gardens, Cambridge, Mass., 1898 (Ckll. in litt.).

(77) *Fiorinia fioriniæ*, Targ.; 1867–1898. I.

Collected by Mr. J. W. Folsom at the Botanic Gardens, Cambridge, Mass., 1898 (Ckll. in litt.). It is recorded from Washington, D.C., Maryland, Colorado, and California, on Camellia, Japan quince, *Arabia* and *Ficus elastica*.

Lecaniinæ, subjoined.

(78) *Lecanium Canadense*, Ckll.; 1895–1898. N.

On white oak at Lawrence, Mass. Prof. S. J. Hunter records it from Kansas on *Ulmus americana*. It was originally described from Canada as *Lecanium caryæ*, var. *Canadense*, Ckll. It is also recorded from Maine on *Ulmus*.

(79) *Lecanium Cockerelli*, Hunter; 1899–1897. N.

Described by Prof. Hunter from Kansas on *Ulmus americana* and *Juglans nigra*. This is the most common and conspicuous *Lecanium* found in Massachusetts, and is found on *Quercus alba*, *Q. rubra*, *Q. ilicifolia*, and sweet fern, *Comptonia asplenifolia*, at Lawrence, Methuen, Dracot, and Andover.

Five species have been added to our list since the publication of the first article. The above last two are added to complete the list up to date, and include all the described Massachusetts Coccidæ known to me, but by no means all that really exist, as I have many others not yet studied, and expect to find many more new to our fauna.

NOTES.

(1) Reviewing the preceding literature on the Coccidæ of Massachusetts, we find 79 species and varieties to inhabit the State, leading all others by 7. New Mexico* comes next with 73. California at least 65, and Colorado 37 species.

(2) Massachusetts has 44 native and 35 introduced species, with one whose home is as yet unknown, but no doubt is introduced, which would make 36. Greenhouses produce 16, all of which are introduced species, 10 ant-nest coccids, with 5 attended by ants, 3 of these sometimes found in nests of ants, and 6 species have been found on fruit exposed for sale.

(3) The locality in which the writer has been collecting Coccidæ is about six miles each way, the City of Lawrence being in the centre; in this small district he has found (11) *eleven* species that had been previously recorded from Massachusetts, 39 new to the fauna of the State, 15 new species and 7 new varieties and one genus new to the United States.

(4) The first ant-nest coccid known to occur in the United States was found by Prof. Cockerell in Colorado in 1891. Previous to this there had been only one other species known to inhabit ant-nests—a very peculiar pearl-like creature found in the West Indies. We have now 24 species of coccids normally inhabitants of ant-nests; 15 of these are found in the United States, 10 of which have been found by the writer in Massachusetts. England has 4, New Zealand, Trinidad, Ceylon, France, and the West Indies, 1 each.

(5) I am very much indebted to Prof. Cockerell for his valuable assistance in the study of our Massachusetts Coccidæ, and in no instance have I passed upon the identity of a single species. All have been studied and determined by him. Furthermore, he has had the kindness to look over all my MS. and made such changes as he, in his good judgment, saw fit, and no less than 41 letters have been written by him to me in connection with the Coccidæ of Massachusetts. It should be said, also, that Dr. L. O. Howard has taken much interest in all the parasites sent him, reared by me from coccids. And also Prof. J. D. Tinsley, who has described jointly with me some of my new species of Dactylopiids. I wish to publicly thank them and acknowledge their many kindnesses.

*(6) Since the above was written, Prof. Cockerell and Mr. Parrott have described five new species and varieties from New Mexico.

A CHECK-LIST OF THE MASSACHUSETTS COCCIDÆ.

Icerya, Sign.
I. Purchasi, Mask., 1878.
Eriococcus, Targ.
E. azaleæ, Comst, 1881.
E. quercus, Comst., 1881.
Gossyparia, Sign.
G. ulmi, Geoff., 1764.
Ripersia, Sign.
R. lasii, Ckll., 1896.
R. Kingii, Ckll., 1896.
R. flaveola, Ckll., 1896.
R. Blanchardii, King and Ckll., 1897.
R. minima, Tinsley and King, 1899.
Dactylopius, Costa.
D. citri, Risso. 1813.
D. adonidum, L., 1769.
D. sorghiellus, Forbes, 1885.
D. sorghiellus, var. Kingii, Ckll., 1897.
D. claviger, King and Tinsley, 1897.
D. Cockerelli, King and Tinsley, 1898.
D. pseudonipæ, Ckll., 1897.
Phenacoccus, Ckll.
P. aceris, Sign., 1875.
P. americanæ, King and Ckll., 1897.
Sphæroccus, Mask.
S. sylvestris, Ckll. and King, 1898.
Asterolecanium, Targ.
A. quercicola, Bouche, 1851.
Orthezia, Bosc.
O. insignis, Dougl., 1887.
Kermes, Auctt.
K. galliformis, Riley, 1881.
K. pubescens, Bogue, 1898.
K. nivalis, King and Ckll., 1898.
K. Kingii, Ckll., 1898.
Lecanopsis, Targ.
L. lineolatæ, King and Ckll., 1897.
Lecanium, Illig.
L. hesperidum, L., 1758.
L. hemisphæricum, Targ. (= coffeæ, Auctt., not of Walker.)
L. quercifex, Fitch, 1856.
L. quercifex, Fitch, var., 1898.
L. filicum, Boisd., 1868.
L. corylifex, Fitch, 1856.
L. cynosbati, Fitch, 1856.
L. tessellatum, Sign., 1873.
L. Kingii, Ckll., 1898.
L. tarsale, Sign., 1873, var.
L. Fletcheri, Ckll., 1893.
L. nigrofasciatum, Perg., 1898.
L. pallidior, Ckll. and King, 1899.
L. caryæ, Fitch, 1856.
L. canadense, Ckll., 1895.
L. (saissetia) anthurii, Boisd., 1868, var.
L. Cockerelli, Hunter, 1899.
Pulvinaria, Targ.
P. innumerabilis, Rathv., 1854.
P. innumerabilis, var. tiliæ, King and Ckll.
P. Macluræ, Kennicott in Fitch, 1855.
Lichtensia, Sign.

L. viburni, Sign., 1873, var.
Aspidiotus, Bouche.
A. hederæ, Vall., 1829.
A. aurantii, Mask., 1878.
A. perniciosus, Comst., 1881.
A. ancylus, Putn., 1877.
A. ficus, Ashm., 1888.
A. cyanophylli, Sign., 1869.
A. articulatus, Morg., 1889.
A. Forbesi, Johnson, 1896.
A. Fernaldi, Ckll., 1898.
A. smilacis, Comst., 1883.
A. sp. prob. young of A. dictyospermi, Morg., 1889.
A. Crawii, Ckll., 1897.
Diaspis, Costa.
D. carneli, Targ., 1868.
D. amygdali, Tryon, 1889.
Aulacaspis, Ckll.
A. rosæ, Bouche, 1833.
A. bromeliæ, Kerner, 1788.
A. Boisduvalii, Sign., 1869.
A. elegans, Leon.
Parlatoria, Sign.
P. proteus, Curt., var. Pergandii, Comst., 1881.
P. zizyphus, Lucas, 1853.
P. (prob. proteus) var. crotonis, Ckll., 1895.
Mytilaspis, Sign.
M. pomorum, Bouche, 1851.
M. citricola, Pack, 1870.
M. Gloverii, Pack, 1869.
Pinnaspis, Ckll.
P. pandani, Comst., 1881.
Chionaspis, Sign.
C. furfurus, Fitch, 1856.
C. furfurus, var. fulva, King, 1899.
C. pinifoliæ, Fitch, 1855.
C. spartinæ, Comst., 1883.
C. Lintneri, Comst., 1883.
Ischnaspis, Dougl.
I. longirostris, Sign., 1882.
Fiorinia, Targ.
F. fioriniæ, Targ., 1867.

NOTES ON SOME HYMENOPTERA.

BY T. D. A. COCKERELL, N. M. AGR. EXP. STA.

Vespa diabolica, Sauss., mut. *Fernaldi* (Lewis).—Prof. C. H. T. Townsend collected last year some specimens of *V. diabolica* and *V. occidentalis* on the Rio Ruidoso, N. M. Among the former I find an example which exactly agrees with the description of *V. Fernaldi*, Lewis, but it is evidently only a form of *diabolica*.

Bembidula mesillensis, Ckll.—This was described as a variety of *B. capnoptera*, but the discovery of the female shows it to be a distinct species. The ♀ differs from the ♂ by having the thoracic markings cream-colour instead of deep yellow; the clypeus entirely creamy-yellow, it and the narrow lateral marks densely covered with silvery pubescence; the marks on scutellum round instead of pear-shaped; the anterior tarsi with a well-formed blackish comb. The last dorsal segment is strongly

punctured, with a smooth median line, and has a yellowish spot on each side. The lateral ridges are only indicated posteriorly, and that feebly. Legs as in the ♂, except for the tarsal comb. This ♀ was taken by Prof. Townsend at La Cueva, Organ Mts., N. M., 5,300 ft., Sept. 3, 1898, at flowers of *Lippia Wrightii.*

Sphecodes perlustrans, Ckll.—This was described from a single specimen; a second was taken at Mesilla Park, N. M., March 30th, 1899, by Mr. S. MacGregor. A new examination shows the mandibles to be notched, not simple as described.

Perdita grandiceps, Ckll.—Described from a single ♂. Prof. Townsend took 3 ♂ 1 ♀ (♂ ♀ in cop.) at flowers of *Fallugia paradoxa*, var. *acuminata*, Wooton, La Cueva, Organ Mts., N. M., Sept. 3rd, 1898. The ♀ runs to 21 in my *Perdita* table in Bull. Lab. Denison Univ., 1898, and to 23 in the table in Proc. Phila. Acad., 1896. It differs from *P. phymatæ* by its colourless nervures; from *P. verbesinæ*, var. *nigrior*, by being only 5 mm. long; from *P. sidæ* by having the flagellum pale ochreous (instead of orange) beneath, the upper edge of the clypeus not at all whitish, the mesothorax more bare, with considerably shorter hairs, and the marginal cell broader in proportion to its length. From the ♂ *grandiceps* it differs by having the head of ordinary shape and size, the cheeks unarmed, and the face wholly without light markings. The tip of the abdomen is brownish-orange.

Melissodes grindeliæ, Ckll.—To the localities for this species must be added Los Vegas, N. M., where I took a ♂ in July.

BEES AND FLOWERS.

Prunus (garden plum).—At Santa Fé, N. M., in the spring of 1898, Miss Myrtle Boyle collected from the flowers *Andrena prunorum*, Ckll. (♀ ♂, the ♂ a var. with antennæ wholly black), *Halictus sisymbrii*, Ckll. (♀), and *Osmia lignari*, Say (♂).

Ungnadia speciosa (det. E. O. Wooton).—At Dripping Spring, Organ Mts., N. M., April 23rd and 24th, I found this beautiful shrub in full bloom. On April 23rd the following bees were visiting it: *Osmia lignaria*, Say (♂ ♀, abundant); *Xylocopa arizonensis*, Cr. (abundant); *Agapostemon texanus*, Cr. (1 ♀); *Augochlora neglectula*, Ckll. (abundant); *Halictus amicus*, Ckll. (♀, abundant); *Bombus Morrisoni*, Cr. (a few); and *Anthophora lesquerellæ*, Ckll. (♂, rare).

Dithyræa wislizeni.—On the campus of the N. M. Agricultural College, Mesilla Park, May 7th, 1898, the following bees were at the flowers: *Anthidium larreæ*, Ckll. (one); *Neolarra pruinosa*, Ashm. (many); *Perdita callicerata*, Ckll. (♀); *P. exclamans*, Ckll. (♂), and *P. punctosignata*, Ckll. (♀). The species of *Perdita* had appeared before their proper flowers (*Baileya* and mesquite) were out, so they resorted to the *Dithyræa.*

SOME NEW SPECIES OF HADENA.

BY JOHN B. SMITH, RUTGERS COLLEGE, NEW BRUNSWICK, N. J.

Hadena (Xylophasia) runata, n. sp.

Ground colour smoky brown or blackish, varying in shade even to a reddish admixture. Head usually a little reddish, with a black band crossing the front. Collar usually paler at the base, crossed by a black line about the middle ; usually tipped with paler scales. Thorax with a distinct divided crest, which often contains an admixture of lighter vestiture, patagiæ with paler tips, a blackish submargin, and a disk as dark as the general ground colour. Primaries powdery, mottled, with all the markings well defined ; no contrasts, save that the median space is usually darker than the rest of the wing. Basal line geminate, black, including a few whitish scales, and reaching to a narrow, short basal line which ends at the point of junction with the transverse marking. T. a. line black, geminate, the outer defining line well marked, the inner vague, except at the internal margin, where an oblique black shade extends inward along the margin. The line is well removed from the base, outcurved as a whole and in the interspaces. T. p. line geminate, blackish, the inner portion lunulate and best marked, the outer more even, less defined, marked with blackish dots on the veins. As a whole, it is outwardly bent on the costa, and then runs very evenly and almost parallel with the outer margin. A vague median shade is visible on the costa and between the ordinary spots, but becomes lost below that point. S. t. line white or very pale brown, only a little irregular, except where it forms a distinct, though small, W on veins 3 and 4. Two or three sagittate black spots precede the line at the W, and a dusky shade may extend the full length, sometimes adding other spots, or again losing all of them. Terminal space darker, except at apex. A series of black terminal lunules. Fringes cut with pale and a similar line at base, giving a festooned appearance. Claviform short, broad, more or less black filled, a black or blackish shade extending to the t. p. line and broadening outwardly. Orbicular oval, oblique, with a black ring inwardly edged by pale scales, of the palest ground colour. Reniform large, kidney-shaped, upright, incomplete above and below, outlined in black outside of a paler line, the centre of the ground colour. As the median space is darker than the rest of the wing, these spots are relieved and somewhat contrasting. Secondaries smoky gray, paler at base, fringes yellow at base ; there is a dusky discal lunule and a blackish

terminal line. Beneath powdery dull gray, primaries with a vague discal blotch, secondaries with a lunule and an exterior line.

Expands 1.25–1.60 inches = 30 to 40 mm.

Habitat: Winnipeg, Manitoba, June and July (Hanham); Pullman, Washington (Piper).

A good series of specimens shows little variation save in the shade of the ground colour. In genital structure the insect resembles *desperata;* but in general appearance it is much more like *indirecta*, *mactata* or *divesta*.

Hadena (Xylophasia) Barnesii, n. sp.

In general appearance resembling *auranticolor*, and heretofore confused with that species. It is smaller, however, in average expanse, much paler and less red in ground colour, and altogether a more sordid, less brilliant species. The violet shading in the s. t. space of the old species is replaced by gray or whitish in the new form, and the secondaries are of a dull, even smoky gray, without a trace of yellow or red in the ground or whitish at the base. All the markings are present on the primaries, less strigate and better defined than in *auranticolor;* but without preceding dashes to the W, or interspaceal streaks in the terminal space.

Expands 1.50–1.68 inches = 37–42 mm.

Habitat: South Dakota (Truman); Glenwood Springs, Colorado, in September; Yellowstone Park, Wyoming (Dr. Barnes).

A series of seven specimens has been compared with a similar number of *auranticolor* before the species was decided to be distinct. There is no difficulty in separating the two forms, but it is not so easy to localize the differences. The much duller primaries and the very evenly dark secondaries are the most obvious features.

The sexual parts of the male are disproportionately small, but of the same general type as in *auranticolor*.

Hadena (Xylophasia) dionea, n. sp.

Ground colour an even, obscure fuscous gray without contrasts. Head with a dusky frontal line, collar with a blackish central line, patagiæ with a black submargin. Abdomen mouse gray. Primaries with all the maculation present, but obscure. A short black basal streak. Basal line geminate, smoky, marked on the costa only. T. a. line geminate, smoky, incomplete, outwardly curved, and with small outcurves in the interspaces, marked by an oblique black streak on the

inner margin. T. p. line geminate, very even, well out-curved over the cell, but only a little indrawn below; inner portion blackish, narrow, interrupted; the outer punctiform and sometimes obsolete. S. t. line paler, broken, very vague, with a W reaching the outer margin, preceded by a series of blackish spots or shadings, which may be in part or altogether obsolete. A series of smoky terminal lunules. Ordinary spots concolorous. Claviform well defined by a narrow black line, extending across the median space to the t. p. line, or connected with it by a black shade. Orbicular moderate or large, varying somewhat in form, with a smoky, often incomplete, outline. Reniform large, upright, well defined at the sides only. Secondaries evenly mouse gray, the fringes paler. Beneath smoky, powdery, with a common outer line and discal spots on all wings.

Expands 1.40–1.60 inches = 35–40 mm.

Habitat: Volga, South Dakota (Truman).

This is the species which I called *idonea*, Grt., in my revision of the species of *Xylophasia*, Proc. U. S. N. M., XIII., 438, 1890, and credited from Mr. Grote's original description to Texas, Arizona, and Wisconsin. The species resembles *cariosa* in general type of maculation, but is entirely even in ground colour, and, as I pointed out, unquestionably good. I found when studying the genus originally that there were three allied forms generally mixed under *cariosa*. I separated the most intensely marked species, resembling *verbascoides* as much as it did *cariosa*, under the name *nigrior;* from specimens named by Mr. Grote I identified the form here described as *idonea*. Later I had an opportunity of comparing the Guenée and Grote types directly in the British Museum, and found, to my surprise, that both names were applied to one species. Comparing the two original descriptions, it will be seen that Guenée had a specimen distinctly shaded with reddish, while Mr. Grote had one in which this was replaced by a dirty luteous gray.

The present name is based on four males in rather bad shape, received from Mr. P. C. Truman; but I have seen others sufficient to indicate that there is very little variation.

Hadena (Luperina) virguncula, n. sp.

Ground colour dull reddish gray. Thoracic vestiture interspersed with gray hairs, giving it a hoary appearance; no markings. Primaries without contrasts, median space a little darker above the middle, terminal space evenly dusky, s. t. space dusky on the costa. Basal line

indicated by a few black scales. T. a. line geminate unusually far from base, outer defining line blackish, inner scarcely traceable, except for the somewhat paler included shade, outwardly oblique, irregularly out-curved in the interspace, and reaching the inner margin at about its middle. T. p. line geminate, not much out-curved over the cell, and only a little in-curved below; inner defining line blackish and partly lunulate, outer even smoky, broken and almost lost below vein 3. S. t. line very even, of the ground colour, defined by the darker terminal space and a dusky preceding shade. A series of black, small, terminal lunules. Orbicular barely indicated by a few blackish scales. Reniform large, upright, subquadrate, as a whole paler than the ground colour, so as to be relieved and somewhat prominent. Secondaries smoky, fringes whitish. Beneath smoky with pale powderings, a common outer line, and on secondaries with a discal spot. Vestiture of the legs and breast with a reddish tinge.

Expands 1.60 inches = 40 mm.

Habitat: Garfield Co., Colorado, 6,000 feet (Bruce).

A single female which has been awaiting a mate some ten years or more. The species has the wing-form and general habitus of *passer*, Gn., but it is unlike any of the forms of that variable species. It has scarcely a trace of a claviform, and the complete neatly defined s. t. line, and very oblique irregular t. a. line, will serve as further distinctive features.

Hadena allecto, n. sp.

In maculation almost like *mactata*, all the observed differences being well within the range of variation; but without a trace of the reddish or brown shadings of the old species; all is black and gray. The median space is the darkest part of the wing, the ordinary spots being very large and of the paler ground, save for a central filling in the orbicular.

Expands 1.40 inches = 35 mm.

Habitat: Calgary, Sept. 17 (Dod); Brandon, Manitoba (Hanham); Volga, So. Dakota (Truman).

Six specimens, representing both sexes, are before me, and do not vary a single mm. in expanse. I considered them for a long time as a local race of *mactata*, and so named them for my correspondents who have other specimens of this species. In actual ornamentation there is no appreciable difference, but the difference in colour is constant, and the genitalia of the male confirm the distinctness of the more western form, though the general type is the same.

Hadena catalina, n. sp.

Ground colour a pale reddish luteous, more or less powdered with leaden gray, which, on the primaries, may darken all save the median space, and strongly mark even this. Basal line geminate, leaden gray, reaching into the submedian interspace. T. a. line blackish, geminate, outwardly oblique and slightly out-curved in the interspaces. T. p. line blackish, geminate, inner portion narrow, crenulate, outer punctiform, the black being followed by white dots; as a whole slightly and evenly bisinuate. S. t. line pale, irregularly sinuate. A row of small blackish terminal lunules. Fringes dusky, with a pale line at base, and cut with pale. A vague leaden gray median shade is marked on the costa between the ordinary spots, is lost in the reniform, but sometimes reappears below, running close to and parallel with the t. p. line to the inner margin. Claviform small, outlined by gray scales; evident in all specimens. Orbicular moderate, rather irregular, outlined in blackish and with a leaden gray centre. Reniform large, oblique, a little constricted centrally, black ringed and filled with blackish, forming the most prominent feature of the ornamentation. Secondaries with a smoky shade which darkens outwardly; a dusky discal lunule, and a narrow median line; fringes yellow, with a smoky interline. Beneath paler, powdery; the wings darker outwardly, both pairs with discal spots and outer dusky lines. Head and thorax immaculate, or the collar may have a leaden gray central line and the patagiæ a blackish submargin.

Expands 1.12–1.28 inches = 28–32 mm.

Habitat: Catalina Springs, Arizona, April 8–12.

Five specimens from the U. S. National Museum, collected by Mr. E. A. Schwarz. In wing-form the species resemble *mactata*, and the secondaries are distinctly excised below the apex. The ground colour and the contrasting dark reniform give a resemblance to certain forms of *Mamestra* allied to *trifolii*, and there is nothing in *Hadena* with which this species is likely to be confused.

The male genitalia are simple; the harpe is enlarged at tip, oblique, inwardly fringed with spinules; the clasper is stout, moderate in length, not much curved, and blunt at tip.

Of the locality above given (not to be found on any map), Mr. Schwarz says it is "a small spring at the foot of the Sta. Catalina Mountains, 15 or 16 miles north-west of Tucson, and about 2,900 feet above sea level; situated within the giant Cactus forest, directly above the region of *Larrea mexicana*."

Hadena pausis, n. sp.

Ground colour powdery fuscous gray or brown. Head a little paler, with a darker frontal line. Collar with a broken dusky central shading, patagiæ with a blackish submargin. Primaries with all the usual markings present, but broken and not contrasting. A curved black streak in the submedian interspace, from the base to the t. a. line, is the most prominent feature of the wing. Basal line geminate, broken, brown, reaching to the black streak, and within this is the palest part of the wing. T. a. line geminate, blackish, broken, a little out-curved in the interspaces, and moderately out-curved as a whole. T. p. line geminate, blackish, very even ; outwardly oblique from costa to vein 6, then forming between 5 and 6 an almost right angle, and nearly evenly oblique from that point to the inner margin. S. t. line pale, very irregular and obscure; broken and scarcely traceable in some specimens. A crenulated, black terminal line. Fringes interlined with blackish. Little dusky rays are sent into the terminal space on the interspaces. A blackish or black quadrate spot connects s. t. and t. p. line in the submedian interspace, and a similar connection may be made by a narrow black line opposite the cell. Claviform large, extending more than half way across the wide median space ; outlined in blackish, else concolorous. Orbicular irregular, moderate in size, outlined in blackish, brown centred. Reniform narrowed above, dilated below, and constricted in the centre ; oblique, outlined in black and with a blackish central shade. A vague median shade is traceable on the costa only. Secondaries smoky, paler at base, with a vague discal lunule. Beneath dark gray, powdery, with a common outer line and a discal lunule on all wings ; but all this may be wanting, and the wings be evenly powdered.

Expands 1.20–1.40 inches = 30–35 mm.

Habitat : Los Angeles County, California, in June (Coquillett); San Francisco, Cal.

This species belongs to the *binotata* series, and agrees with it in wing-form. The primaries have the outer margin a little toothed ; the secondaries are excised below the apex. In the eight specimens before me there is little variation, the only obvious features being the black basal streak and, to a less extent, the black patch in the s. m. interspace connecting the t. p. and s. t. lines.

The genitalia of the male are somewhat complex. There is an oblique triangular patch at the tip of the harpes densely set with spinules,

and there are two claspers, both of them stout, curved and obtusely terminated.

Hadena ethnica, n. sp.

Ground colour an even, dark, smoky brown. Head and thorax immaculate. Primaries with all the usual markings present, but so slightly relieved that at first sight they seem altogether wanting. Ordinary lines geminate, marked on the costa by pale spots which form the only visible contrasts. T. a. line nearly upright, feebly out-curved in the interspaces. T. p. line punctiform, the points being followed by minute white dots, very evenly bisinuate. S. t. line irregular, marked by scattered white scales, and by a very slight difference between s. t. and terminal space. A series of evident terminal lunules. Claviform very short and broad. Orbicular rather large, round, darker filled. Reniform large, upright, a little constricted centrally, with a somewhat darker filling. Secondaries smoky brown, with a coppery tinge and a dusky terminal line. Fringes yellow at base, and tipped with whitish. Beneath smoky brown, powdery, secondaries with a darker discal spot.

Expands 1.80 inches = 45 mm.

Habitat: Yosemite, California; emerged July 23rd, 1891, from a larva on Manzanita.

This is an overgrown species of the *binotata* series. The fringes on both wings are unusually long, on the primaries just a little scalloped, on the secondaries distinctly excised below the apex. The size and inconspicuous markings should separate it without difficulty from its allies.

The male genitalia are very simple; the harpes subparallel, tip oblique and fringed with spinules, clasper moderate in length, slender, curved and acute at tip.

Hadena laetabilis, n. sp.

Head and thorax dull brown, immaculate, save that the tips of collar, edge of patagiæ and dorsal tuftings are sprinkled with bluish. Abdomen pale mouse gray, with a brown tuft on the basal segment. Primaries, median space smoky brown, basal and s. t. spaces a light sapphire blue, appearing almost transparent in fresh specimens, markings brown. Basal line brown, marked on the costa only, this region being more or less brown powdered to the t. a. line. There is also a brown powdering at the inner margin in some specimens. T. a. line marked by the difference in colour between basal and median space, nearly upright to the submedian vein, then with a long out-curve to the inner

margin. T. p. line single, black, lunulate, outwardly curved on the costa and over cell, slightly in-curved below. S. t. line visible as a slender blue thread through the brown costal region, then lost in the blue of the s. t. space, this tinge extending to a series of submarginal blackish lunules, and beyond them to the slender dark terminal crescents. Fringes brown, with narrow yellowish interlines, and cut with whitish. Claviform small, black margined, concolorous, a blackish shading extending toward the t. p. line. A slender brown median shade line is marked on the costa, and is again traceable below the reniform, running close to and parallel with the t. p. line. Orbicular moderate or small, contrasting blue, centred with brown. Reniform large, broad, a little constricted centrally, somewhat indefined above and below, blue and contrasting. Secondaries whitish, with a slender, smoky extra-median line, and a broad, blackish outer margin. Fringes brown, with a yellow line at base. In one specimen with a vague discal lunule. Beneath, primaries smoky gray, powdery, with a blackish extra-median line, a pale or dusky spot marking the orbicular, and a yellowish lunule marking the reniform of the upper side. Secondaries white, yellowish toward and on costa, smoky at outer margin, with a narrow smoky outer line, and a dusky discal spot which may be absent.

Expands 1–1.20 inches = 25–30 mm.

Habitat: Santa Fé, New Mexico, July and August (Cockerell), Nos. 1657, 1827 and 3906.

Three male specimens of this very handsome species are at hand. It belongs to the series of which *Smaragdina transfrons* and *Bridghami* are examples, and when fresh is prettier than either. Unfortunately, the beautifully transparent blue dulls rapidly, and appears then like a thin wash of ultamarine over a layer of white. It cannot be easily confused with any other of our species.

The male genitalia are very simple; the harpes narrow obliquely to a somewhat acute tip, which has a fringe of spinules inwardly; the clasper arises from its middle, and is a slender, moderately long and only slightly curved hook.

Hadena viridimusca, n. sp.

Head and thorax brown, powdered with darker scales; head paler in front. Collar with a dark median line, sometimes paler than the thoracic disc. Thoracic tuftings distinct, the posterior paler and sometimes quite contrasting. Abdomen smoky; in the male the edges of the segments

distinctly white-marked. Primaries smoky red-brown, more or less overlaid by mossy yellow-green scales which normally fill the basal, terminal and part of the s. t. space, the centre of the ordinary spots and patches in the median space. Basal line evident, geminate, defining lines not well marked, included space pale and sometimes white-marked. T. a. line geminate, upright a little irregular, defining lines incomplete and not well marked, included space white, forming a somewhat prominent patch on the costa and extending inward a little on the inner margin. T. p. line geminate, not well defined, broken, out-curved over the reniform, then almost upright, included space more or less marked with white scales, especially in the costal region. S. t. line very irregular, marked by the contrast between the mossy powdering of the terminal and darker shading of the s. t. spaces. A series of blackish terminal lunules, followed by a series of pale or yellowish blotches at the base of the fringes and opposite the termination of the veins. A median shade line is traceable below the reniform. Orbicular small, round, black ringed, green centred. Reniform upright, moderate in size, incompletely outlined, a little constricted centrally. Claviform extending half way across the median space, outlined by black scales, yellow-green filled, and this greenish shade is usually continued beyond the spot across the median space. Secondaries deep smoky-brown, hardly paler at the base, fringes with a pale line at the base. Beneath gray, powdery, outer margins paler; with a common extra-median line and a black discal spot on all wings. Primaries with a whitish cloud on the costa at the inception of the extra-median line.

Expands 1.05–1.12 inches = 27–29 mm.

Habitat: Columbus, Ohio; VI., 20; VII., 9, at sugar (N. W. Tallant); Texas, V., 16 (Belfrage); New Jersey.

Four specimens, 2 males and 2 females, are at hand, and I have seen others. The species is allied to *miseloides* in appearance, but is smaller, with much narrower, stumpy wings. It is, perhaps, nearer to *marina*, with which I tried hard to identify it, but is not so bright as that species, the fringes are even, and the form of the primaries is different. The variation consists partly in the amount and intensity of the mossy green, which fades to yellow in old examples, and partly in the prominence of the white filling of the ordinary lines.

A NEW PLAGODIS.

BY HARRISON G. DYAR, WASHINGTON, D. C.

Plagodis approximaria, n. sp.

Fore wings dark ochreous, paler about the faint purplish cloud that rests on internal margin; a cluster of blackish strigæ in centre of basal space on internal margin and a larger cluster in the black cloud; otherwise the ground colour is without strigæ. T. a. and t. p. lines slightly curved, broad, somewhat clouded, nearer together than usual, blackish brown, the t. p. line the more distinct. Hind wings paler, largely overspread by a purplish shading that extends from a large cluster of dense blackish strigæ at inner angle. Thorax ochre, purplish in front and on the head. Expanse 50 mm.

Two males, Portland, Oregon, April 23rd, 1892. U. S. National Museum, type No. 4110.

SYNOPSIS OF SPECIES OF PLAGODIS.

Notch at inner angle of primaries nearly like the subapical excavation, so that the outer margin looks produced centrally.

Pale yellow, t. p. line diffuse, sinuate, shaded below; other lines obsolete *serinaria*, H.-S.

Ochreous, strigose, t. p. line distinct, straight, t. a. line fainter; discal dot a ring *alcoolaria*, Guen.

Notch at inner angle pronounced, the margin looking straight with a notch below.

T. a. line very faint and diffuse or absent.

Fore wing straw colour, notch moderate.

T. p. line present, not obscured.

No large purplish cloud beyond t. p. line; at most some strigose markings *fervidaria*, H.-S.

A purplish cloud beyond t. p. line .. *keutzingaria*, Pack.

T. p. line absent, lost in a large purplish cloud that reaches middle of wing *nigrescaria*, Hulst.

Fore wing cinerous clay colour; notch large. *emarginaria*, Guen.

T. a. line if faint, not diffuse; usually distinct.

T. a. and t. p. lines remote, narrow and discreet; hind wings usually with a narrow submarginal line *phlogosaria*, Guen.

T. a. and t. p. lines approximate, rather broad and a little clouded; hind wings without any line, a strigose cloud at inner angle *approximaria*, Dyar.

A NEW DACTYLOPIUS (FAM. COCCIDÆ) FROM ARIZONA.

BY T. D. A. COCKERELL, N. M. AGR. EXP. STA.

Dactylopius hymenocleæ, n. sp.—♀. Black when dry, entirely covered and concealed by the firm snow-white ovisac, forming a rounded mass about 4 mm. diam. These masses are adherent to one another, forming very conspicuous white cottony balls on the plant, having a diameter of from ten to twelve mm. The surface of the ovisac is rough, but not at all ribbed. The female, boiled and flattened under a cover-glass, is oval, about 4 mm. long. After being boiled in caustic soda, soaked in alcohol, and mounted in balsam, the insect is found to exhibit two different pigments: one a pale magenta, the other a dark bluish green. Skin with very numerous small circular glands, and a good many rather large dagger-shaped spines, in the caudal region. Legs and antennæ pale brown; legs fairly stout; coxa 99. Femur with trochanter 144, tibia 72, tarsus with claw 60 μ; claw digitules slender, with a very small knob; claw with a minute denticle on the inner side just before the tip; antennæ 7-segmented, the segments measuring as follows in μ:—(1) 28. (2) 25–30. (3) 23–25. (4) 23–31. (5) 15–19. (6) 24–28. (7) 59–64. Embryonic larva large.

Hab.—On *Hymenoclea monogyra* in the river bottom, about six miles from Tucson, Arizona; collected three years ago by Prof. J. W. Toumey. I learn from Prof. Toumey that he had partially described this interesting species; but he has mislaid his MSS., and has no time at present to attend to the matter, so he has asked me to publish a description.

D. hymenocleæ is evidently related to *D. filamentosus*, Ckll., by its 7-segmented antennæ, its bluish-green pigment, and its manner of collecting in globular masses on the plant. The legs of *filamentosus* are larger (coxa 120, femur with trochanter 177, tibia 90, tarsus with claw 75 μ); and the denticle on the inner side of the claw, instead of being almost at the tip, is about half way between base and tip, and is quite large.

D. filamentosus has a large anal ring, with very large bristles upon it, and the region around it, while presenting a good many circular glands, does not have the dagger-shaped spines.

I will take this opportunity to record that Prof. Toumey sent me *Lecaniodiaspis rufescens* (Ckll.), collected at Tucson on *Fouquiera splendens*. I now consider this to be a valid species, distinct from *yuccæ*, as many specimens from various localities preserve the distinctive characters.

IN RE SPILOSOMA CONGRUA, WALK.

BY A. RADCLIFFE GROTE, A. M., ROEMER MUSEUM, HILDESHEIM, GERMANY.

In reference to the present controversy my testimony is as follows: I examined, in 1867, Mr. Walker's material. This represented a form unknown to me, undoubtedly a *Spilosoma*, not a species or form of *Hyphantria*. I was so struck with this that I drew up a description and carefully compared the palpi and antennæ. From these and the slightly larger size, I felt confident that it was a *Spilosoma* unknown to me at the time. The description is published in Trans. Am. Ent. Soc., 1868, but I have no copy, unfortunately, at this writing, of the paper. My memory is vivid that I compared it with *Hyphantria cunea*, and it was not that species nor any form of it. I conjectured even, at the time, that the material might be European with a wrong locality, so dissimilar was it from *S. virginica* or *S. latipennis*, the latter form being known to me from Stephen Calverley's collections from Long Island before, long before, its description by Stretch. Years afterwards, Dr. Thaxter sent me specimens from the East, which I at once recognized as *S. congrua* from my memory and my notes. These specimens belonged to *S. antigone*, which I set down accordingly as a synonym of *S. congrua* in the pages of the CANADIAN ENTOMOLOGIST.

There is, finally, one point to which I call attention. In 1867 Mr. Walker was arranging the collection. I directed his notice at the time to the fact that he had quite often mixed up different species under one name. It may be, then, that there were two species under *congrua*, but I think not. Mr. Walker adopted, at the moment, some of my suggestions, but the time was too brief to allow me to overhaul the whole of the American material, about which, as a whole, I knew besides, at the time, too little. But I knew *Spilosoma* and *Hyphantria* sufficiently as to give my determination weight. Now, it is a fact that Mr. Butler sorted over the collection, and as to this work Prof. Smith's Cat. No. 44 gives us, incidentally, valuable information. And it is a fact that I found in the Noctuids, in 1867, more mixing of species than comes out after Butler and Smith's sorting and taking or fixing of Mr. Walker's types. This was done without sufficient study of Mr. Walker's text in the B. Mus. Lists. Mr. Walker's material bore no type label; it was in 1867 (and, I think, again in 1880) simply stuck above the printed name, cut out of the B. M. Lists, as I remember. Misidentifications of Walker's description or determination occur in the genera *Apatela*, *Hadena*, *Mamestra*, *Hypena*, etc. See my papers in the CANADIAN ENTOMOLOGIST and in the Proc. of the American Philosophical Society.

BOOK NOTICE.

THE PSYCHICAL POWERS OF ANTS.*—By E. Wasmann, S. J.

In this folio volume of 135 pages, which appears as "Zoologica, Heft 26," the author has given us his 95th contribution to the knowledge of guests and parasites of the ants and termites. As the title shows, the work is of a philosophical nature and deals with the mental side of ant-life, being in the main concerned with a refutation of the theory recently advanced by A. Bethe, who ascribes to ants and other invertebrates in general, no higher psychological rank than that of mere "reflex-machines."

The introduction reviews in brief the views of various earlier writers on the subject, and indicates the author's position, in that while rejecting Bethe's reflex theory, he also avoids the tendency exhibited by many naturalists to ascribe to ants powers of mind approaching those of man. Next follows a chapter devoted to an analysis of Bethe's theory, and showing Dr. Wasmann's reasons for the rejection thereof. In this connection the author writes: "It appears to me a reliable criterion that the animals concerned are not mere reflex-machines, but are guided, at least in the higher activities of life, by sensory perception and sensation on a foundation of inherited instinct is to be found in this: the possession of special sense organs in combination with a central nervous organ, as well as their manifold and suitable employments through which the animal turns impressions from the outside to use in the necessities of its life."

The succeeding chapter considers the question, "How do ants know one another?" And here much evidence is brought forth to show that the recognition is due to sensory perception, and is not automatic. The antennæ (especially the tips) are concerned in the discrimination, and Dr. Wasmann agrees with Forel that the detection of odour is very largely depended upon therefor. The subject next approached is "How do ants find their way?" Reference is made to the well-known fact that with many species a definite path is followed during journeys to and from the hunting-grounds, while in other species the wanderings are made much at random. Not only are ants able to follow their paths, but they also discern the direction in which the trail leads; *i. e.*, if it is running towards the nest or from it. Bethe has advanced his theory of the

*Die psychischen Fahigkeiten der Ameisen. Von E. Wasmann, S. J. Stuttgart, Erwin Nagele, 1899.

"polarization of the scent" to explain the objective difference between the going and the returning tracks, without (says Wasmann) telling us in what manner it is subjectively perceived by the ants. This theory is attacked by Dr. Wasmann on the ground of its inapplicability in some instances and contradiction in others. He declares that the phenomena may be explained in a much simpler way by assuming a different form of the scent which marks paths leading in different directions. He further ascribes sensory sensations and powers of impulse to these insects in order to account for their voluntary actions. His account (pp. 31 and 32) of *Formica sanguinea* taking a short cut from one nest to another, instead of following the ordinary path, is very suggestive of a true sense of direction. Some visual perception of changes in their paths is perhaps indicated by the observations recorded a few pages farther on.

Can ants see? The treatment of this query is masterly, and it is impossible to do the author justice in a short review. After showing that those ants which, like *Formica*, have well-developed compound eyes, are possessed of good visual powers, and the ability to use their visual images in various emergencies, he compares them with some other genera, such as *Solenopsis (S. fugax)*, where the eyes, being composed of but four or five facets, are of much less sensitivity, though by no means insensible to light. Now is brought in a very pretty side issue, which bears, however, on the main question, namely, that those guests of the mimicry type which live with ants having well-developed eyes, copy their hosts in a different way from those which dwell among small-eyed forms. Among the large-eyed ants the mimicry by the guest begins in a resemblance of colour, followed by some likeness in build, this latter not extending to an actual copy of the details, but resting largely upon deceptive light reflections. Among guests of small-eyed or blind forms the mimicry begins with a resemblance in sculpture and vestiture, and this is succeeded by a likeness in build, which amounts to an actual similitude between the parts involved to the corresponding organs of the host; it culminates at last in the similarity of antennal structure between guest and host. These points are brought out in two lithographed plates. The conclusions to which they lead are these: In guests of such ants as can see well, the mimicry aims to deceive the sense of sight of the host; in guests of ants which are blind or nearly so, the mimicry aims to deceive the antennal sense of touch.

Regarding the powers of intercommunication, Dr. Wasmann not only contends that they possess these powers, but gives (on pp. 69 and 70) a scheme showing the signals which he has seen used to induce various activities. He holds that these actions point neither to an "intelligent understanding," nor to pure reflex action, but are sufficiently explained through sensory perception and the power of originating impulses.

The next chapter is of a controversial character, replying to the question, "What proof can be brought against our acceptance of psychical powers in ants?" The claim is made that Bethe has, without satisfactory knowledge of the facts and without exercise of necessary caution, set up his new reflex theory too boldly; and that this theory is unacceptable because of its innate indefensibility.

"The different forms of learning* in man and the animals" is the next subject treated. On the ground of biological facts, Dr. Wasmann recognized six divisions, as follows:

I. Independent learning.
 1. Through instinctive exercise of reflex action.
 2. Through sensory experience, by means of new associations of ideas presented thereby.
 3. Through sensory experience and the intelligent application of earlier conditions to new.

II. Learning through the influence of others.
 4. Through influence of the impulse of imitation.
 5. Through human training.
 6. Through intelligent instruction.

Regarding the above forms of learning, he makes, among others, the following generalizations:

In man alone are all six forms found. Other animals possess, according to the grade of their psychical development, either the first alone, the first and fourth, or the first, second, fourth and fifth.

In ants, as well as in the higher animals, the first, second, fourth and fifth are indicated. But the second and fifth forms are more highly developed in some other animals than in ants.

Only the third and sixth forms prove the possession of a real intelligence on the part of the learner. As these cannot be demonstrated in animals, no actual proof of animal intelligence is existent.

*I can get no better rendering of "Lernens" than this.

The proposition set up by the modern school of animal psychology, that learning through individual experience is a criterion of intelligence, must therefore be condemned as untenable. It is also incorrect to make "learning through individual sensory experience" a criterion of psychical power.

A further discussion of evidence offered on the psychical life of ants occupies many pages. The fact is brought out that many of the most ordinary of their activities bear directly on the subject, while on the other hand numerous apparently intelligent proceedings may be referred to simpler factors. Dr. Wasmann concludes that ants are neither intelligent miniature men nor mere reflex machines, but are organisms possessed of the power of sensory sensations and voluntary action, and that their inherited instincts may be modified in many ways through sensory perception and circumstances of sensation, as well as through the influence of previously gained experience. An application of the Darwinian factors, he says, fails to explain the development of the relations between ants and termites and their respective guests. The fact that ants, in their symbiosis, often raise their worst enemies, is as irreconcilable with the Darwinian form of the theory of descent as with the acceptance of an animal intelligence.

A supplement follows, describing six new species of myrmecophilous Proctotrupidæ. At the request of many readers, the author has added a list of his published works on myrmecophilism and termitophilism, which counts up ninety-four titles, the present contribution being the ninety-fifth.

No student of ant-life or of comparative psychology should fail to read this memoir. It is to be hoped that it will serve to still further stimulate the study of the mental side of ants, and in this line of investigation it sets a model of careful observation and cautious conclusions.

H. F. Wickham.

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TABLES FOR THE DETERMINATION OF THE GENERA OF COCCIDÆ.

BY T. D. A. COCKERELL, N. M. AGR. EXP. STA.

SUBFAMILIES.

Males with compound eyes 1.
Males with simple eyes 3.
1. Anal ring with hairs (♀) *Orthezиinæ.*
Anal ring hairless (♀) 2.
2. Mouth-parts present in adult ♀; legs present in all stages *Monophlebinæ.*
Mouth-parts absent in adult ♀; legs absent in intermediate stage of ♀ *Margarodinæ.*
3. Abdomen of ♀ terminating in a compound segment; anal orifice hairless 4.
Abdomen of ♀ not so terminating 5.
4. Insects with a scale formed entirely of secretionary matter without admixture of the exuviæ; adult ♀ retaining legs and antennæ *Conchaspinæ.*
Insects with a scale composed partly of the exuviæ; adult ♀ without legs *Diaspinæ.*
5. Insects enclosed in a resinous cell with three orifices; adult ♀ apodous, with the terminal segments produced into a tail-like organ, bearing at the extremity the anal orifice; a prominent spinelike organ above the base of the caudal extension *Tachardiinæ.*
Not so 6.
6. Females with the posterior extremity cleft; anal orifice closed above by a pair of triangular plates *Lecaniinæ.*
Not so; triangular anal plates absent *Coccinæ.*

In preparing the above table, I have borrowed in places from that of Green, *Coccidæ of Ceylon*, p. 12.

ORTHEZIINÆ.†

♀ antennæ 8 jointed *Orthezia*, Bosc.*

♀ antennæ 4-jointed *Ortheziola*, Sulc.

MONOPHLEBINÆ.

♀ with a long posterior ovisac ; ♂ without fleshy caudal processes 1.

♀ with conspicuous waxy lamellæ or processes more or less covering the dorsal surface, but no long ovisac ; ♂ unknown ... *Walkeriana*., Sign.

♀ without a long posterior ovisac, or the lamellæ of *Walkeriana* 2.

1. Antennæ of adult ♀ 11-jointed *Icerya*, Sign

Antennæ of adult ♀ 9-10-jointed *Proticerya*, Ckll.

2. ♂ abdomen without long fleshy processes *Palæococcus*, Ckll.

♂ abdomen with long fleshy processes, usually 8 in number *Monophlebus*, Leach.

There are several other supposed genera in the books. *Crypticerya*, Ckll., is essentially an *Icerya* without an ovisac ; in the table it will fall with *Palæococcus*, but having no material of the latter genus, I am not sure whether the two are identical. *C. Townsendi*, var. *plucheæ*, has rows of waxy processes, clearly indicating an approach to the condition of *Walkeriana polei.*

Llaveia, Sign., *Ortonia*, Sign., *Protortonia*, Towns., *Guerinia*, Targ., and *Tessarobelus*, Mont., seem all to be identical with *Monophlebus*. *Drosicha*, Walk., is said to differ from *Monophlebus* by its 9-jointed antennæ, but it is doubtless an immature form of the latter genus.

The Monophlebinæ are really separable into two distinct tribes : (1) *Monophlebini*, in which the males have fleshy caudal processes, and the secretion of the females is powdery or cottony, including only *Monophlebus ;* and (2) *Iceryini*, in which the males have not the fleshy processes, and the secretion of the females is more in the form of waxy plates, including *Icerya*, *Walkeriana*, etc.

†By the characters given, *Phenacoleachia*, n. g. (type *Leachia zealandica*, Maskell, Tr. N. Z. Inst., XXIII., p. 26), will fall in this subfamily, but it has strongly Dactylopiine features. Of this *Phenacoleachia zealandica* I have males, received from Mr. Maskell, and there is a slide of the females, from the same source, in the collection of the U. S. Department of Agriculture. The female resembles that of *Dactylopius*, having two long caudal filaments as in that genus, instead of the brush of *Orthezia ;* but it has curious compound eyes consisting of ocelliform bodies forming a single ring round the head, interrupted above and below. The adult female, by its elongated form, elongated mentum, and curved spines at the end of the antennæ, resembles *Rhizœcus ;* but it differs in its 11-jointed antennæ (Maskell, l. c., Pl. VI., f. 3). The anal ring bears six stout bristles.

*An overlooked synonym of *Orthezia* is *Cyphoma*, Gistel, 1848, Nat. des Thier., p. 151. Type *O. characias.* (Not *Cyphoma*, Bolt., 1798).

MARGARODINÆ.

Tribes.

Subterranean; anterior legs of both sexes adapted for digging *Margarodini.*
Arboreal; anterior legs normal *Xylococcini.*

Margarodini.

Includes only *Margarodes*, Guilding (syn. *Porphyrophora*, Brandt.).

Xylococcini.

♂ with no caudal brush *Cœlostoma*, Mask.
♂ with a caudal brush 1.
1. Antennæ of adult ♀ 9-jointed; temperate region of N. Hemisphere *Xylococcus*, Lw.
Antennæ of adult ♀ 10- or 11-jointed; Australia .. *Callipappus*, Guèr.

CONCHASPINÆ.

Includes only *Conchaspis*, Ckll. *Ourococcus*, Fuller, has not been described; but a specimen of *O. casuarinæ* received from Mr. Fuller has a good deal of resemblance, in its caudal structures, to *Conchaspis*, but is yet quite distinct from it. The ♀ *Ourococcus*, very differently from *Conchaspis*, has a long glassy tail.

COCCINÆ.

Tribes.

Living in galls in Australia; end of abdomen produced into a narrow tail *Brachyscelini.*
Either not living in galls, or end of abdomen not specially modified to form a tail 1.
1. ♀ enclosed in a complete sac of waxy or horny texture; skin usually with figure-of-8 glands; legs absent in adult; larva not fringed with spines *Asterolecaniini.*
♀ globular or reniform, in a hard shell; anal ring with hairs in larva, but not in adult; larva fringed with spines *Kermesini.*
♀ not enclosed in a hard shell or waxy or horny sac; or if enclosed (*Porococcus*, *Cryptoripersia*), antennæ and legs present 2.
2. Newly-hatched larva with rows of dorsal spines *Eriococcini.*
Newly-hatched larva without rows of dorsal spines *Dactylopiini.*

Brachyscelini.

On *Casuarina*; larva not fringed with spines *Frenchia*, Mask.
On *Eucalyptus*; larva fringed with spines 1.

1. Legs all present, but short and unfit for use..... *Apiomorpha*, Rübs.
 Hind legs only present, these long..... *Opisthoscelis*, Schrad.
 Legs all absent..... *Ascelis*, Schrad.

The genus *Cystococcus*, Fuller, has not yet been sufficiently described to be included in the tables. It forms spherical galls on *Eucalyptus*, and has neither legs nor antennæ.

Asterolecaniini.

Insect with a fringe of glassy rods..... *Asterolecanium*, Targ.
Insect without such a fringe..... 1.
1. Antennæ well-developed in adult ♀ *Lecaniodiaspis*, Targ.
 Antennæ rudimentary or absent in adult ♀ 2.
2. Covering waxy; end of abdomen strongly chitinous.. *Cerococcus*, Comst.
 Covering horny; end of abdomen not or hardly chitinous; scale with a caudal process ending with an orifice.... *Solenococcus*, Ckll. (*Solenophora*, Mask.)
 Covering waxy; end of abdomen not chitinous; scale irregular, with no caudal process..... *Pollinia*, Targ.

Kermesini.

Contains only one genus, *Kermes*, Boitard. By the larva, this appears to be allied to the *Eriococcini;* whereas the larvæ of the *Asterolecaniini* show them to be allied to the *Dactylopiini. Kermes* has no triangular anal plates in any stage, and is not related to the *Lecaniinæ.*

Eriococcini.

Anal ring with hairs..... 1.
Anal ring without hairs..... 4.
1. Antennæ and legs absent in adult ♀ *Nidularia*, Targ.*
 Antennæ and legs well formed in adult..... 2.
2. Adult naked to the last..... *Rhizococcus*, Sign.
 Adult surrounded by cotton, but dorsally naked.... *Gossyparia*, Sign.
 Adult contained in a hard black scale..... *Porococcus*, Ckll.
 Adult living in a gall on oak; antennæ 6 jointed; tarsi 2-jointed; skin with figure-of-8 glands..... *Olliffiella*, Ckll.
 Adult forming a cottony sac..... 3.
3. Anal ring with 8 hairs; caudal lobes long..... *Eriococcus*, Targ.§

*I suppose this belongs to *Eriococcini*, but the larval characters are not sufficiently known. The adult is naked, resting on a cushion of cotton, which surrounds it, as in *Gossyparia*, from which it is distinguished by lacking legs and antennæ.

§The subgenus *Thekes*, Crawford (type *E. eucalypti*), has 7-jointed antennæ; those of typical *Eriococcus* are 6-jointed.

Anal ring with 6 hairs; no caudal lobes..... *Gymnococcus*, Dougl.

4. Legs and antennæ present and well-developed in adult; skin with grouped glands and truncate spines; last joint of larval antenna long..... ...*Pseudococcus*, Westw.
(*Coccus*, Sign.)

Antennæ present, but only one pair of legs.....5.

Antennæ and legs absent; not living in a gall; newly-hatched larva with four rows of dorsal spines on each side of the middle line..... *Carpochloroides*, Ckll.

5. Only the hind legs present; skin without grouped glands or truncate spines; newly-hatched larva with only one complete row of dorsal spines on each side of the middle-line, but one or two other rows partially developed anteriorly..... *Capulinia*, Sign.

Only the first pair of legs present, these very short; living in a gall; newly-hatched larva with two rows of dorsal spines on each side of the middle-line; shape of adult elongate, with parallel sides, abdomen with long hairs..... *Cylindrococcus*, Mask.

Olliffia, Fuller, not yet described, is very close to *Eriococcus*.

Dactylopiini.

Anal ring without hairs..... 1.

Anal ring with hairs.....2.

1. Adult ♀ with all the legs present; first four small, hind pair very large; margin with spines..... *Sphærococcopsis*, Ckll.†

Adult ♀ with the antennæ minute, conical; legs entirely absent; skin with many circular glands..... *Sphærococcus*, Mask.
(Type *S. casuarinæ*, Mask.)

Adult ♀ with the antennæ reduced to a mere tubercle; spiracles small; legs absent; skin tuberculate, but without conspicuous glands..... *Phœnicococcus*, Ckll.
(Type *P. Marlatti*, Ckll.)

2. With well-formed legs and antennæ in adult 3.

Legs and antennæ absent or rudimentary in adult.....15.

3. Antennæ 9-jointed.....4.

Antennæ 8- (sometimes 7-) jointed 6.

Antennæ not more than 7-jointed 10.

4. Anal ring with 8 hairs..... *Puto*, Sign.

Anal ring with 6 hairs 5.

†Type *S. inflatipes*, Mask., Tr. N. Z. Inst., XXV., p. 238.

5. ♀ having the aspect of a *Dactylopius* *Phenococcus*, Ckll.
♀ covered with waxy lamellæ, like an *Orthezia*..... *Ceroputo*, Sulc.
6. Insect with large projecting marginal tubercles.. .. *Tylococcus*, Newst.
Without projecting marginal tubercles..... 7.
7. Anal ring of ♀ with more than 8 hairs..... *Lachnodius*, Mask.
Anal ring of ♀ with 6 hairs..... 8.
8. ♂ with four caudal filaments *Oudablis*, Sign.*
♂ (so far as known) with only two caudal filaments..... 9.
9. Body very elongate; antennæ 8-jointed, shorter and stouter than in *Dactylopius*; eyes present; mentum short. *Pergandiella*, Ckll. (*Westwoodia*, Sign.)
Body oval, usually with cottony tassel..... *Dactylopius*, Costa.
Body subglobular, enclosed in a cottony sac *Erium*, Crawford. (Type *E. globosum*.)
10. Antennæ 6- or 7-jointed; when 7-jointed, distinguished from *Dactylopius* by the stouter legs and usually subterranean habitat..... 11.
Antennæ 5-jointed; form elongate; anal tubercles prominent *Rhizæcus*, Kunck.
11. ♂ apterous, with relatively short antennæ..... *Fonscolombia*, Licht. (*Pseudochermes*, Nitsche; *Apterococcus*, Newst.)
Not so 12.
12. Legs extremely thick, like crab's claws..... *Pseudoripersia*, Ckll.
Not so; legs ordinary..... 13.
13. ♀ enclosed in a waxy sac..... *Cryptoripersia*, Ckll.
Not so 14.
14. "Antennæ very close together" (Tinsley).. *Ripersiella*, Tinsley. (*R. rumicis* and *maritima*.)†
Antennæ normally placed..... *Ripersia*, Sign.
15. Newly-hatched larva elongate, with 6-jointed antennæ..... 16.
Newly-hatched larva oval or suboval 17.
16. Terminal antennal segment of newly-hatched larva oval, little longer than the one before. *Pseudolecanium*, Ckll.
Terminal antennal segment of newly-hatched larva very large, as long as the three before..... *Chætococcus*, Mask.

*A genus of few species, found in Europe; when the male is unknown, the female is usually referred with safety to the large genus *Dactylopius* rather than to *Oudablis*.

†Prof. Tinsley has named this genus, and indicated its characters, in a thesis for the degree of B.S., presented to the N. M. Agricultural College, May 31, 1899. He will shortly prepare a paper describing the genus in detail.

17. Larva with 5-jointed antennæ; anal ring of adult with only 4 hairs..... *Cryptococcus*, Dougl.
Larva with 6-jointed antennæ, joint 6 long; anal ring of adult with 6 hairs..... *Antonina*, Sign.
Larva with 7-jointed antennæ, sides very hairy; anal ring of adult and larva with 17 hairs..... *Kermicus*, Newst.

TACHARDIINÆ.

Anal ring with numerous bristles..... *Tachardia*, Blanchard.
Anal rings without bristles; anus furnished with two membranous lobes, the edges of which are bristly..... *Gascardia*, Targ.

(To be continued.)

THE CLOVER-ROOT MEALY BUG.

Dactylopius trifolii, Forbes.

BY R. H. PETTIT, ASSIST. ENTOMOLOGIST AGR. COLLEGE, MICH.

On July 1, 1893, the writer collected a number of mealy bugs on clover *(Trifolium pratense)* at Ithaca, N. Y. They were found at about the level of the ground between the several stems of the plant, and also on the roots under the soil. On July 17 of this year the same insect was

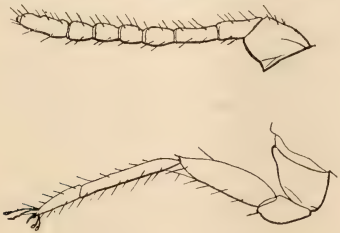


FIG. 34.—DACTYLOPIUS TRIFOLII.

found on the same plant at Agricultural College, Mich. As they were both supposed to be *D. trifolii*, Forbes, a comparison was made with the original description.*

In this description the insect is credited with having seven joints to the antennæ, and as the adult females found here and at Ithaca have eight, the male pupa was examined. This form has seven joints, and

* 14th Rep. of State Entomologist of Ill. for year 1884, by S. A. Forbes.

agrees perfectly with the description. The material left by Mr. G. C. Davis, on which he based his article on "Mealy Bugs and Their Allies"†, was examined and found to agree with both the description and the recently collected specimens. As no description of the adult female has as yet been found by the writer, it was thought that one might be of some interest.

The adult female measures a little more than two millimetres in length, is reddish-brown in colour, covered with a coating of waxy or mealy secretion. The legs are dirty yellow in colour. From the sides project from 15 to 17 (usually 17) waxy processes, forming a fringe around the body in the usual manner, with the shortest filaments near the head, and those near the tail considerably longer, sometimes one-third as long as the body. The antennæ are 8-jointed; joint 1 is swollen, as broad as long; 2 and 3 subequal, each about as long as 1; 4, 5, 6 and 7 subequal, a little over half as long as 2 or 3; 8 usually a little longer than 5 and 6 joined. There is considerable variation in 4, it is sometimes smaller than 5, 6 or 7, and sometimes slightly larger. The legs are dirty yellow, in length the tarsus is slightly more than half the tibia, which about equals the femur. Digitules 4; the 2 superior long and slender, the 2 inferior shorter and more stout. (The digitules were not distinct, but appeared as described.) Anal tubercles not very prominent, with a mass of small glandular spots, and bearing one long hair, with sometimes several smaller ones. Among the glandular spots are placed two conical projections or processes on each tubercle. These processes are from two to three times as long as broad at the base.

The figures of the antenna and leg (Fig. 34) are from drawings made from the Ithaca specimens in 1893.

NEW COCCIDS FROM KANSAS.

BY PERCY J. PARROTT, MANHATTAN, KANSAS.

Antonina Nortoni, Parrott and Ckll.

Sac white, subglobular, cottonlike, completely enveloping female.

♀ oval, plump, cream-coloured, with slight tinge of brown on margin. Boiled in caustic potash, becomes transparent, with the exception of the antennæ, the two pairs of spiracles, and ultimate segment, including anal region, which are a dark yellowish-brown. There are many single glands, especially towards and about posterior segments;

† Insect Life, Vol. VII., 1894, p. 168.

they are less numerous anteriorly. On outer side of each spiracle there is a crescentic group of rather large circular glands, placed very close together. Antennæ aborted, short, thick, composed of three segments measuring respectively 18–25, 13–16, 27–28 mm. Mouth-parts large. Spiracles chitinous, large and extended. Anal orifice circular, situated in a depression, surrounded by a strong chitinous ring. Anal ring with six long, stout hairs measuring from 53 to 89 mm. in length. Around

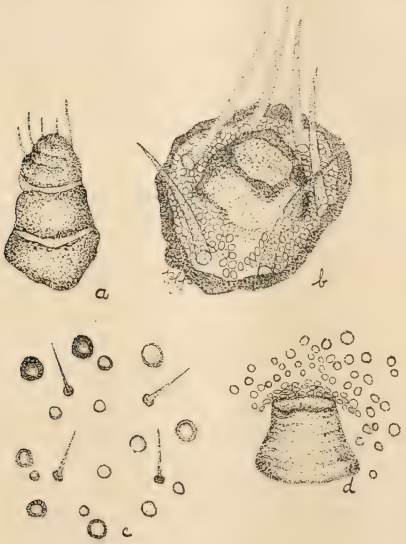


FIG. 35.—ANTONINA NORTONI.

the anal area are many slender hairs, very much smaller than the bristles of the anal ring.

In Fig. 35 *a* represents the antenna; *b*, anal ring; *c*, portion of derm about anal ring; *d*, spiracle.

This species was collected by Mr. J. B. Norton, on April 25th, 1899, at the bases of the stems of *Boutelona racemosa* on Blue Mont, Manhattan, Kans.

Aspidiotus (Targionia) Marlatti, sp. nov.

♀ scale 2 mm. in diameter, flat to slightly convex, dark reddish-brown, resembling walnut, on margin to a lighter shade at centre; exuviæ lateral, large, black, often covered with brownish secretion; ventral pellicle thin, light reddish-brown, not easily separated from scale, and leaves no mark on host plant when detached.

♀ oval, white, with irregular spots of yellow; ultimate segment yellow, with the margin dark brown and strongly chitinous. Boiled in caustic potash, the female becomes transparent, with the exception of the lobes, which remain yellow. There are three pairs of lobes (Fig 36), which are short, broad, and quite widely separated, with the sides parallel; first pair either broadly rounded or truncate, and notched at distal end; second and third lobes similar, broader than mesal lobes, notched on

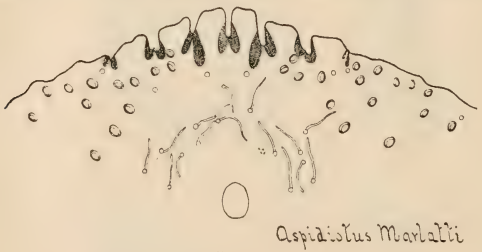


Fig. 36.

margin, with that part lateral of the notch generally the larger. There is one small spine at the base of each of the mesal lobes, one larger one at the base of the lateral margin of each of the second and third lobes respectively, and another one on margin as distant from the third spine as the combined width of one mesal and one second lobe. Chitinous processes are of medium size, one pair to each incision; the ones lateral of mesal lobes are the largest. Plates are short and truncate, and apparently easily shed, as they do not appear in the boiled specimens; in the untreated specimens there are from one to two plates to each incision. There are no groups of circumgenital glands. The dorsal glands are large and fairly numerous. On each side and posterior of the anus there are a few tubular glands.

This interesting species was collected by Mr. J. B. Norton, who found it upon the base of the stems of grasses, *Andropogon furcatus* and *A. scoparius*, on Blue Mont, Manhattan, Kansas, and is named in honor of Mr. C. L. Marlatt, in recognition of his many valuable contributions to the knowledge of the Coccidæ.

THE HABROPODA AND DIDASIA OF CALIFORNIA.

BY CARROLL FOWLER, BERKELEY, CAL.

The following is a list of the species of these two groups occurring in California, with notes on those forms known to me :

Habropoda, Smith.

A small group of bees, comparatively local in their habits, and in appearance very much like the larger species of Anthophora.

Legs with black pubescence..... *floridana.*

Legs with pale pubescence.

Abdomen (except on first segment) with depressed, pale pubescence interspersed with erect, black hairs ; ♂ with scape yellow in front..... *depressa.*

Abdomen without black hairs, pale pubescence erect ; ♂ with scape black..... *miserabilis.*

1. *Habropoda floridana*, Smith.—Redonda, Cal. (H. O. Woodworth), May 23. One female.

2. *Habropoda depressa*, n. sp.

♀ 14 mm., ♂ 12–13 mm. Clothed with mixed black and pale pubescence, the latter depressed on the abdomen.

♀.—Head black, clothed with ashy pubescence, mixed with black on vertex, dense and white on cheeks and labrum, thin on clypeus, which is strongly punctured ; antennæ black. Thorax clothed with pale pubescence, thin on disc and strongly mixed with black above, dense white beneath ; wings subhyaline ; legs clothed with pale pubescence more or less tinged with yellow, very dense on posterior femora and tibiæ, brown on metatarsi beneath, a bunch of black pubescence at apex of posterior metatarsi ; claws reddish. Abdomen black, narrow apical margins of the segments brown ; first segment clothed with erect, white pubescence, except on apical margin, where it is black ; the remaining segments with appressed, yellow pubescence interspersed with erect black hairs. Ventral segments shining, fringed with long, pale pubescence.

♂.—Differs from ♀ in having narrow lines on the sides of the face, clypeus except narrow lateral margins, mandibles except tips, and scape in front yellowish-white ; legs with white pubescence, which is a little longer on the tibiæ and posterior tarsi behind, and quite long on the anterior and posterior femora ; venter thickly clothed with white pubescence.

Habitat: Berkeley, Cal., Feb. 22 to May 1; numerous specimens. Santa Catalina Island (H. O. Woodworth), June 21; one specimen. During the earlier part of the season several specimens were collected upon the white flowers of Cytisus poliferus in the botanic garden. About the middle of April quite a number of females were observed collecting pollen from oak blossoms. A few males were collected upon Ranunculus californicus. On April 22, 1899, several nests were examined. They are, in general, much like those of many other bees of solitary habits, being grouped together in quite large numbers, and each one consisting of a single burrrow extending about a foot into the hard earth. The cell at the end is about 10 millimetres wide by 16 in length, lined with a thin, hard layer of wax and filled with a mixture of pollen and honey. A large number of the bees had taken possession of an old squirrel hole, from the inside of which, at a depth of about a foot, their burrows were found extending off in all directions, while the outside burrows extended nearly straight downward. The traces of a number of old burrows would indicate that the same spot had been visited from year to year. Only a few of the nests at this date were complete, and no larvæ were found.

3. *Habropoda miserabilis*, Cress., ♂.

♀.—Differs from male in being a little larger, having the face black, posterior legs clothed with long dense pubescence slightly tinged with yellowish, that on apical portion of the middle tibiæ above fuscous, at the tips of the posterior metatarsi a bunch of black hair. Both males and females have the pubescence on the under side of the legs more or less fuscous. The males before me have the "large sub-trefoil mark on the clypeus" extending somewhat on the region above.

San Francisco, Cal.; April. Twenty specimens, collected chiefly upon Phacelia californica.

Didasia, Patton.

The bees of this genus fly somewhat later in the season. None of the species are common in Berkeley, but D. enavata is very abundant in Southern California during the early part of summer.

Abdomen with black pubescence, except on segments 1–2; not banded*nerea.*

Abdomen with pale pubescence; white bands or fascia on apical margins of the segments.*

*D. *alboresta*, Prov., seems to differ from *enavata* and *cinerea* chiefly in size, being only 8 mm. in length. The species is unknown to me.

Tarsi dark brown or black ; ♂ with the third antennal joint slender, three times the length of the second.....*cinerea.*

Tarsi pale ferruginous ; ♂ with third antennal joint not especially slender ; about twice the length of the second.....*enavata.*

1. *Didasia nerea*, n. sp.

10.5 mm. Clothed with black pubescence, ochraceous on thorax and base of abdomen above.

♀.—Head black, finely punctured, clothed with long, dense, black pubescence, thinner on vertex and ochraceous on posterior part of occiput ; antennæ entirely black. Thorax black, clothed with dense pubescence, yellowish above, black beneath ; tegulæ black ; wings hyaline, veins dark brown, second submarginal cell about half the length of the first, narrowed somewhat above ; legs clothed with black pubescence, long and dense on posterior tibiæ and metatarsi. Abdomen black, with yellowish pubescence on the first two segments, somewhat mixed with black on the second, the remaining segments with rather short, black pubescence. Venter clothed with black pubescence.

♂.—Differs from female in having the pubescence, throughout, longer and more bushy, that on legs with a somewhat griseous appearance in certain lights ; the posterior femora and tibiæ somewhat incrassate, their metatarsi slender and curved, and the apex with a subacute tooth, which is not especially prominent ; apical segment of the abdomen bidentate.

Habitat : Tulare, Cal. (H. O. Woodworth); May. 10. Two specimens.

2. *Didasia alboresta*, Prov.—Los Angeles, Cal.

3. *Didasia cinerea*, n. sp.

♂ 13 mm. Clothed with cinereous pubescence, apical margins of the abdominal segments with white fascia.

♂.—Head black, punctured, clothed with griseous pubescence, slightly darker on vertex ; apical margin of the clypeus nude ; antennæ entirely black, third joint slender, broadening toward apex, three times the length of the second. Thorax black, finely punctured, clothed with rather dense, ashy pubescence, tinged with yellowish above ; tegulæ dark brown to black, shining ; wings hyaline, veins dark brown to black, second submarginal cell about half the length of the first, narrowed above ; legs clothed with rather long, pale pubescence ; the four posterior legs robust, the femora and tibiæ incrassate, the basal joint of the posterior tarsi

curved and having at apex beneath a prominent, curved, subacute tooth, which is flattened and dilated at base; tarsi brownish-black. Abdomen black, shining, clothed with erect, pale pubescence, longest at base and more or less mixed with black on segments 4–6; segments 2–6 with distinct, white, marginal fascia; apical segment bilobate. Venter clothed with white pubescence.

Habitat: Berkeley, Cal.; May and June. Three males. This species is closely allied to *D. australis*, which, however, has the second submarginal cell smaller and not narrowed above. It may readily be distinguished from the male of *D. enavata* by the longer third antennal joint, the much more prominent lobes of the apical segment of the abdomen, etc.

4. *Didasia enavata*, Cress. (=D. tricincta, Prov.).—Santa Catalina Island, Santa Barbara, and Redlands, Cal. (H. O. Woodworth); June. Numerous specimens.

DESCRIPTION OF THE LARVA OF HADENA MISELOIDES, GUEN.

BY HARRISON G. DYAR, WASHINGTON, D. C.

Egg.—A little less than spherical, the base flat. Twelve sharp ribs run to the vertex, which is large, circular, reticulate, with a central elevation at the micropyle; one-third of the way down these ribs neatly alternate with twelve others, forming twenty-four ribs around the base. Ribs straight; space distinctly, regularly cross striate. Diameter .8, height .7 mm.

Stage I.—Head rounded, mouth pointed; shining yellowish; width .5 mm. Body thickened at thorax and joint 12, robust, sharply tapering at joint 13, which is placed almost under joint 12. Translucent yellowish, shining and sticky like a slug, the food showing by transparency. Setæ minute and pale, not glandular, tubercles obsolete. Rests curled on the back of the leaf; several larvæ on the same leaf, but not gregarious. Hatched when found.

Stage II.—Head whitish, shining; width .7 mm. Body as before, but less yellowish, shining, but not sticky and green from the food. Joint 2 in front is yellowish, and the sides of joint 12 are whitish from the large tracheæ showing through the skin. Setæ nearly imperceptible.

Stage III.—Head small for the body, somewhat retracted, pale luteous; width 1.1 mm. Body robust, thorax and joint 12 enlarged, the latter somewhat angular, shining, translucent green, appearing all dark

green from the food ; three white dots on each segment on tubercles i. and ii., and a third not on a tubercle before ii., in line with it ; on thorax the dots are on i. a, i. b, and a dot before.

Stage IV.—As in the next stage, but without a dot before the spiracle ; width of head 2.0 mm.

Stage V.—Head testaceous green, small ; width 2.5 mm. Thorax no longer thickened, but joint 12 sharply humped, descending perpendicularly to the anal feet. Subtranslucent velvety green, frosted whitish subventrally, dorsal vessel darker green. A moderately broad, diffuse, rather faint white stigmatal line, faint at the ends. Tubercles i. and ii. and a dot before ii. distinct, pale yellow, with dark green rims ; iv. to vi. and a dot before spiracle white. Tubercle iv. is opposite the upper edge of the spiracle, except on joint 12, where it is below the lower edge. At the end of the stage the larva turned black, all the tubercles and dots yellow, and spun a rather firm cocoon on a piece of bark. Imago in thirty days.

This larva apparently omitted the normal fourth stage. In the last stage, also, the head is smaller than would be expected ; but the moth that emerged was a rather small male.

Food plant.—Cat briar *(Smilax rotundifolia)*.

CHLORIPPE CELTIS (BOISD.-LEC.) CAPTURED ON MONTREAL ISLAND.

BY CHARLES STEVENSON, MONTREAL.

On the 21st July, Mr. E. Denny, who often accompanies me on my entomological rambles, brought me a cyanide bottle full of butterflies which he had collected for amusement's sake. On looking at it I immediately saw a specimen that was new to me, and was congratulating myself on getting what I thought would be a new addition to the *Satyrinæ* of my collection. My pleasure was increased, on consulting Dr. Holland's "Butterfly Book," to find it was a *Chloripe celtis*, Boisd.-Lec., ♀, or Hackberry butterfly. (Plate XXIII., fig. 4.) A species, he states, as found generally from southern Pennsylvania, Ohio, Indiana, and Illinois, to the Gulf of Mexico. I immediately called my friend's attention to the specimen, and he remembered the particular place he had found it, because he thought at the time it was something he had not seen in my collection. So ever since we have watched the locality, but have not been successful in obtaining another. It was caught in the Outremont

district, just outside the city limits of Montreal. The only explanation I can find for its appearance is that it may have been imported in the chrysalid stage among some plants by some florist, as there are several nurseries in the neighborhood. The prevailing winds at the time would not favour migration.

A NEW NOCTUID OF THE GENUS CIRROPHANUS.

BY T. D. A. COCKERELL, N. M. AGR. COLLEGE.

Cirrophanus Dyari, n. sp.—♀. Expanse 34 millim. General colour and markings just as in *C. triangulifer*, Grote, except as regards the following particulars : The general colour is more ochreous—not so orange ; the t. p. line curves inwards *to a point not far from the middle of the wing, whence it rapidly bends ontwards for a short distance*, after which it again bends downwards and inwards to the inferior margin ; the s. t. line is further from the margin, and deeply shaded about the middle with ochreous ; the oblique dark line from the lower part of the t. p. line to the costa is distinct, and has a sharp zigzag near its middle. It results from the direction of the t. p. line that the light patch at the anal angle is more extensive than in *C. triangulifer*, but it is broken by a dark shade representing the lower part of the s. t. line. Hind wings strongly suffused with gray, with a curved gray line crossing the middle. Thoracic tufts deep brownish-orange. On the under side the primaries, except their margins, are strongly shaded with blackish.

Fore tibiæ with a spine. Frontal tubercle well developed, with a semilunar hollow above it, surrounded by a strong rim.

Hab.—Fillmore Canon, Organ Mts., New Mexico, Aug. 28 (Ckll.). This was recognized as a distinct species by Dr. H. G. Dyar, but though I urged him to describe it, he would not. It is very different from *C. duplicatus*, Smith, but closely allied to *C. triangulifer*, from which it differs at once in the position of the notch in the t. p. line. The females of *triangulifer* in the National Museum have the hind wings without any dusky shade or lines ; but Grote (Ill. Essay) figures a specimen with dusky hind wings, but with the s. t. line much nearer the margin than in *Dyari*.

The frontal tubercle of *Dyari* is perhaps a little less prominent than in *triangulifer*, but there is no noteworthy difference. The ♂ of *triangulifer* has the frontal tubercle much more produced and the hind wings less rounded than the ♀.

The type of *Dyari* is in the U. S. National Museum.

LIFE HISTORY OF HYPSOROPHA HORMOS, HÜBN.

BY HARRISON G. DYAR, WASHINGTON, D. C.

H. hormos is not uncommon on the persimmon in Alexandria County, Virginia. The species is double-brooded.

Egg.—Less than hemispherical, domed; ribbed with about 48 ribs around the margin, rather low, distinct, diminishing by confluence in pairs toward vertex, very slightly waved. Cross striæ faint lines crossing the hollows, scarcely indicated on the ribs. Micropyle somewhat broadly finely rounded reticular, not ridged. Diameter .6 mm.

Stage I.—Head rounded, slightly bilobed, colourless, ocelli black; width about .4 mm. Body slender, colourless transparent, food green; feet on joints 7 and 8 rudimentary, not used, larva a semi-looper. Shields scarcely cornified, faintly brown; tubercles distinct, pale, dark bordered; setæ short, stiff, white, i. and ii. in a square. Segments moniliform, incisures well marked, the segments not very strongly 3-annulate. Setæ primary.

Stage II.—Head small, slightly bilobed, whitish, dull; width .6 mm. Body slender, translucent green, food dark green; feet normal, small on joints 7 and 8, but little smaller than those on joints 9 and 10; anal feet projecting backward. No marks; tubercles obscure, setæ minute, i. and ii. faintly whitish.

Stage III.—The same; no perceptible marks; width of head .9 mm.

Stage IV.—Head 1.3 mm. Tubercles i. and ii. and the segmental folds distinctly whitish; no other marks as yet. Another example came out brown spotted at this stage. On the head, a dot on the vertex and at tubercle i.; a dash on each side of the cervical shield; an addorsal blotch on joint 4, and a dot on joint 3; a spot below tubercle i. on joints 5, 6, 7, 8, 10, 11 and 13; a large patch across dorsum on joints 9 and 12 anteriorly; some small dots on the sides and on joint 13 posteriorly.

Stage V.—Head as high as joint 2, scarcely bilobed, pale green, not shining, antennæ and mouth whitish; ocelli pale, in part black; width 1.8 mm. Body a little flattened, feet small, those of joints 7 and 8 slenderer than the others, those of joint 13 projecting backward. Translucent green, incisures folded, whitish, tubercles i. and ii. and the faintest trace of a subdorsal line in a few scattered dots yellowish-white; tubercles iii., iv. and v. and a few dots about the tracheal line also slightly pigmented. Ramifications of tracheæ visible. Tubercle iv. of joint 5 at the upper corner of spiracle, of joints 6 to 9 at the lower corner, of 10 below the middle, of 11 nearly in line with tubercle v., of 12 at the middle.

Stage VI.—Head 2.2 mm. Much as before, but more opaque, the skin whitish-green, the dorsal vessel dark and plainly pulsating. Marks as before, the skin finely peppered with white granules; spiracles reddish. Feet about equal, all with broad claspers, but short.

The brown-spotted form occurs also in this stage and in stage V.

Cocoon a small, compact, fairly tough web covered with bits of leaves, bark or other material.

Pupa.—Light brown, smooth, slightly shining; no cremaster, the anal segment slightly bulging and with two short spines above and eight below in a transverse row. The spines resemble setæ and arise from small tubercles. Surface slightly shagreened, no punctures. A series of fine waved lines about the first three spiracles. Length 12 mm.; width 3.5 mm.

THE DIPHYLISM OF THE DIURNAL LEPIDOPTERA.

BY A. RADCLIFFE GROTE, A. M., HILDESHEIM, GERMANY.

Having brought my studies of the neuration of the diurnals to a preliminary close, I wish to place on record here the conclusions to which they have led. The diphylism is founded on the following characters:

A.—Butterflies having a short third anal vein on fore wings, curving downwardly from base to internal margin, and with only one anal vein on hind wings..... *Papilionides.*

B.—Butterflies having a fork to the second anal vein of fore wings at base, sometimes incomplete, often disappearing through absorption, and with at least two anal veins on hind wings..... *Hesperiades.*

The nomenclature of the veins is unsettled. The submedian fold, usually obsolete, is numbered by Comstock, VI.; this would be the first anal vein. Comstock's vein VII. would be the second anal vein, and the curved and shortened vein which follows in the Papilionides would be the third. This vein is replaced in the Hesperiades by a short vein anastomosing above with the second anal vein (VII.), thus running in an opposite direction to the third anal of the Papilionides. This points to a different origin for the two groups. The fork of the Hesperiades has faded out in the Satyrids and most Nymphalids. It is persistent in the other families, with few exceptions in certain genera, *e. g.*, *Leucophasia.*

The rejection of Mr. Scudder's classification of the diurnals is based on the following grounds: The sequence in specialization of the anal

veins is 3 : 2 : 1, the latter shown by the younger forms, as evidenced by Saturniades, in which the more specialized *Attacinæ* have only one anal vein left on the hind wings. It is impossible to consider the Papilionides, with only one anal vein in hind wings, as representing in any way a primitive form of any of the Hesperiades. The reverse is, from this point of view, a possibility, although rendered improbable by the different type of neuration shown by the fore wings.

I conclude that a linear sequence of the diurnals, in a catalogue or otherwise, should begin with the Papilionides. The neuration of the Hesperiades offers no objection to a connection with the Agaristid-Noctuid stem of Dr. Dyar's Bombycides. The neuration of the Papilionides offers such weighty objections as to render the connection unlikely in the extreme.

CLASSIFICATION OF THE ENTOMOPHILOUS WASPS, OR THE SUPERFAMILY SPHEGOIDEA.

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(Paper No. 5.)

Family XX.—Philanthidæ.

The wasps belonging in this family have a peculiar habitus quite their own. The head *is always wider than the thorax*, the front wings have three cubital cells, while the abdomen, in nearly all the species, has usually a strong constriction between the first and second segments, the first segment being most frequently much narrowed. In only a single genus, *Trachypus*, Klug., is the abdomen distinctly petiolated. The eyes are large and normal, but occasionally exhibit a slight emargination within, and, more rarely, with a distinct emargination, or reniform as in *Trypoxylon* and *Pison*. Most of the species have the abdomen strongly punctured or punctate, and have also a constriction between all the abdominal sutures, although some also have the abdomen smooth and polished, and are without a constriction at the sutures.

All of the wasps in this family are predaceous, the majority of them provisioning their nests with beetles, *Curculionidæ*, *Buprestidæ*, etc., although a few prey upon the bees, *Halictus*, *Andrena*, etc.

The family is dividable into two distinct groups, which I call subfamilies, distinguishable as follows :

Table of Subfamilies.

Hind femora more or less thickened at apex, and squarely truncate and produced beneath; cubitus in hind wings originating at a considerable distance *beyond* the transverse median nervure; metanotum with a well-defined triangular area at base.....Subfamily I., Cercerinæ.

Hind femora not much thickened at apex, and neither squarely truncate nor produced beneath; cubitus in hind wings most frequently *interstitial*, or originating *before* the transverse median nervure, very rarely originating slightly beyond it; metanotum most frequently *without* a well-defined triangular area at base Subfamily II., Philanthinæ.

Subfamily I.—Cercerinæ.

This subfamily is readily recognized by the shape of the hind femora, *which are always thickened and squarely truncate at apex, and produced into a process beneath*, and also by the venation of the hind wings, the cubitus always originating some distance beyond the transverse median nervure.

Only four genera are known, all predaceous on beetles, and distinguished as follows:

Table of Genera.

Second cubital cell petiolate 3.

Second cubital cell *not* petiolate.....2.

2. Dorsal abdominal segments 2–4 with a median transverse furrow or impression.

Third cubital cell quadrate, the third transverse cubitus uniting with the marginal cell at apex; lateral carinæ of the pygidium terminating in a tooth. ♂.....Eucerceris, Cresson.

Third cubital cell not quadrate, the third transverse cubitus oblique, uniting with the marginal cell much before its apex; lateral carinæ of the pygidium in ♂ *not* terminating in a tooth.....Nectanebus, Spinola.

3. Third cubital cell quadrate, the third transverse cubitus joining the marginal cell at apex; dorsal abdominal segments 2–6 with a median transverse furrow or impression. ♀...Eucerceris, Cresson.

Third cubital cell not quadrate, the third transverse cubitus oblique, joining the marginal cell much before the apex; dorsal abdominal segments 2–6 without a median transverse furrow or impression, but usually margined at apex.

First abdominal segment alone much narrowed, not longer than wide, and nearly as wide as the base of second, unarmed beneath ; ventral segments 3–5 usually with a transverse grooved line.....Cerceris, Latreille.

First and second abdominal segments narrowed, the first longer than wide, the second subpyriform, the two united resembling the head and neck of a bottle, and both armed beneath with a tooth or thornlike process.....Didesmus, Dahlbom.

SUBFAMILY II.—Philanthidæ.

This group is distinguished from the preceding by the normally shaped femora, and by the venation of the hind wings, the cubitus being interstitial with the transverse median nervure, or originating a little before it, but *never originating very far beyond it.*

The species falling in this subfamily also seem to have quite different habits, for whereas those of the former prey upon beetles, those in this group, so far as have been observed, prey only upon bees, *Apis*, *Halictus*, *Andrena*, etc.

Nine genera have been recognized, distinguishable by characters made use of in the following table :

Table of Genera.

Eyes not at all emarginate within ; marginal cell at apex more or less distant from the costal margin, or subtruncate, *with* a slight appendage.....2.

Eyes with a more or less distinct emargination within ; marginal cell at apex attaining the costal margin, *without* an appendage.....4.

2. Front wings with the second discoidal cell less than twice as long as wide at apex, the median and submedian cells equal or nearly....3.

Front wings with the second discoidal cell fully twice as long as wide at apex, or even longer.

Third cubital cell, along the cubitus, about twice as long as along the radius ; pygidium in ♀ quadrangular, concave above, the clypeus margined anteriorly, but not dentate ; ♂ *with* the pygidium triangular, the clypeus anteriorly 3-dentate.....Clypeodon, Patton.

Third cubital cell, along the cubitus, usually more than twice as long as along the radius, sometimes thrice as long ; pygidium in ♀ triangular, *not* concave above, either flat or subconvex, the clypeus 3 to 5 dentate ; ♂ with the pygidium most frequently semicircular, or rarely obtusely triangular.....Aphilanthops, Patton.

3. Cubitus in hind wings interstitial with the transverse median nervure; marginal cell in front wings short, scarcely as long as the stigma, the second cubital cell triangular Eremiasphecium, Kohl.

Cubitus in hind wings originating before the transverse median nervure; marginal cell in front wings not short, the second cubital cell trapezoidal Philoponus, Kohl.

4. Abdomen *longly* petiolate, the petiole nearly of a uniform thickness throughout; eyes deeply emarginate within 7.

Abdomen *not* petiolate, sessile.

Eyes deeply emarginate within; cubitus in hind wings variable, most frequently interstitial, or nearly, with the transverse median nervure; abdomen smooth, polished, or at most sparsely or microscopically punctate 6.

Eyes with only a slight indication of an emargination, or at least never deeply emarginate within; cubitus in hind wings most frequently originating a little before the transverse median nervure; abdomen distinctly punctate, often strongly rugoso-punctate 5.

5. Submedian cell in front wings fully as long as the median; third cubital cell, along the radius, not longer than the second; abdomen finely, closely, uniformly punctured, the segments, except the first, not constricted at the sutures Epiphilanthus, Ashm., n. g.
(Type P. solivagus, Say.)

Submedian cell in front wings a little shorter than the median; third cubital cell, along the radius, longer than the second; abdomen usually strongly, coarsely and irregularly punctured, the segments mostly distinctly constricted at the sutures.

Clypeus margined anteriorly, with a pencil of long hairs on each lateral angle; first recurrent nervure received by the second cubital cell before the middle; first transverse cubitus strongly angulated at basal third; ♂ with the last joint of the antennæ much compressed, broadened... Pseudanthophilus, Ashm., n. g.
(Type P. ventilabris, Fabr.)

Clypeus not margined anteriorly, and usually, but not always, without the pencil of long hairs laterally; first recurrent nervure received by the second cubital cell at or near the middle; first transverse cubitus straight or slightly sinuate, but rarely distinctly angulated; ♂ with the last joint of antennæ normal, not compressed Anthophilus, Dahlb.
(Type P. politus, Say.)

6. Labrum deeply emarginate, bidentate ; mandibles simple ; antennæ short, the flagellum stout, joints 2–4 wider than long ; anterior tarsi in ♀ with a long flexible comb ; abdomen smooth, or at most finely microscopically punctate, the segments narrowly depressed at apex..... Philanthus, Fabr.

7. Head large, wider than the thorax, the eyes deeply emarginate within ; metanotum with a distinct, triangular, smooth area at base, but with a median sulcus..... Trachypus, Klug.
= Simplephilus, Dahlb.
= Philanthocephalus, Cam.

North American Species.

Subfamily I.—*Cercerinæ.*

EUCERCERIS, Cresson.
E. laticeps, Cr.
E. flavocinctus, Cr.
E. flavipes, Cr.
E. zonatus, Say.
E. rubripes, Cr.
E. unicornis, Patt.
E. elegans, Cr.
E. vittatifrons, Cr.
var. tricolor, Ckll.
E. superbus, Cr.
E. similis, Cr.
E. fulviceps, Cr.
E. montanus, Cr.
E. insignis, Prov.
E. bicolor, Cr.
E. canaliculatus, Cr.
E. cerceriformis, Cr., ♀.

NECTANEBUS, Spinola.

CERCERIS, Latreille.
C. bicornis, Guer., ♀.
C. biungulatus, Cr.
C. Blakei, Cr., ♀.
C. californica, Cr., ♂.
C. clypeata, Dahlb.
C. compacta, Cr., ♀ ♂.
C. compar, Cr., ♀ ♂.
C. dentifrons, Cr., ♀.
C. Dufourii, Guér., ♂.
C. elegans, Smith, ♂.
C. fasciola, Cr., ♂.
C. finitima, Cr., ♀.
C. firma, Cr., ♀.
C. frontata, Say.
C. fulvipes, Cr., ♀.
C. fumipennis, Say., ♀ ♂.
C. gnara, Cr., ♂.
C. imitator, Cr., ♀.
C. insolita, Cr., ♂.
C. jucunda, Cr., ♂.
C. Kennicottii, Cr., ♂.
C. mandibularis, Patt.
C. mimica, Cr., ♀ ♂.
C. morata, Cr., ♀.
C. nigrescens, Smith.
C. occipitomaculata, Pack., ♂.
C. rufinoda, Cr., ♂.
C. rufopicta, Smith, ♂.
C. sexta, Say, ♂.
C. unicincta, Taschb.
C. venator, Cr., ♂.
?=bicornis, Guér.

C. verticalis, Smith, ♀.
C. vicina, Cr., ♀.
C. Robertsonii, Fox.
C. austrina, Fox.
C. acanthophilus, Ckll.
C. aequalis, Prov.
C. simulans, Sauss., ♂.
C. Montezuma, Cam., ♀.
C. tolteca, Sauss., ♀ ♂.
C. strigosa, Cam., ♀.
C. Maximiliani, Sauss., ♀.
C. aurecfascialis, Cam.
C. geniculata, Cam., ♀.
C. feralis, Cam., ♂.
C. Chiriquensis, Cam., ♀.
C. flavomaculata, Cam., ♀.
C. otomia, Sauss., ♀ ♂.
C. flavida, Cam., ♀ ♂.
C. marginata, Cam., ♀.
C. mexicana, Sauss., ♀ ♂.
C. haustecæ, Sauss., ♀.
C. semipetiolata, Sauss., ♀ ♂.
C. zapotica, Sauss., ♂.
C. obsoleta, Cam., ♀.
C. montivaga, Cam., ♀.
C. Smithiana, Cam., ♀.
C. subpetiolata, Sauss., ♀.
C. truncata, Cam., ♀ ♂.
C. imperialis, Sauss.
C. exsecta, Smith.
C. Esau, Schlett.
C. acolhua, Sauss., ♂.
C. curvicornis, Cam., ♂.
C. hebes, Cam., ♂.
C. azteca, Sauss., ♀.
C. tepaneca, Sauss., ♂.
C. erythropoda, Cam., ♀.
C. rostrata, Smith.
C. bothriophora, Schlett.
C. chrysogastra, Schlett.
C. trichiosoma, Cam., ♂.
C. pilosa, Cam., ♂.
C. scapularis, Schlett.
C. thermophila, Schlett.
C. graphica, Smith, ♀.
C. sonorensis, Cam., ♂.

DIDESMUS, Dahlbom.
D. binodis, Spin., ♀ ♂.

Subfamily II.—*Philanthinæ*

CLYPEODON, Patton.
C. quadrinotatus, Ashm., ♀.
C. concinnulus, Ckll.
C. anglesius, Ashm.

APHILANTHOPS, Patton
A. Elsiæ, Dunn.
A. frigidus, Smith.
A. subfrigidus, Dunn.
A. taurulus, Ckll.
A. Coquilletti, Ashm.
A. hispidus, Fox.
A. Utahensis, Bak.
A. laticinctus, Cr.
A. Bakeri, Dunn.
A. Foxii, Ashm.
A. nevadensis, Cr. (Philanthus).
A. marginipennis, Cam., ♂.
A. punctifrons, Cam., ♀.

EREMIASPHECIUM, Kohl.
PHILOPONUS, Kohl,
EPIPHILANTHUS, Ashmead.
(1) E. solivagus, Say.
(2) E. Sandbornii, Cr.
PSEUDANTHOPHILUS, Ashmead.
(1) P. ventralis, Fabr.

? P. frontalis, Cr.
? P. xanthostigma, Cam., ♀.
? P. maculifrons, Cam., ♂.
? P. multimaculata, Cam., ♂.

ANTHOPHILUS, Dahlbom.

A. politus, Say.
A. albifrons, Cr.
A. flavifrons, Cr.
A. pacificus, Cr.
A. albopilosus, Cr.
A. scelestus, Cr.
A. dubius, Cr.
A. sublimis, Cr.

PHILANTHUS, Fabricius.

P. bilunatus, Cr.

TRACHYPUS, Klug.

T. mexicanus, Sauss.
T. punctifrons, Cam., ♂.
T. hirticeps, Cam., ♂.
T. gracilis, Cam., ♂.

FAMILY XXI.—Trypoxylidæ.

This family has usually been classified with the family *Crabronidæ*, with which it has no affinity whatever, its affinities being closest to the Larridæ, through *Pison*, and to the Philanthidæ through *Trachypus;* but is readily separated from both by the characters made use of in my table of families.

Trypoxylon, the type of the family, was probably classified, by the older entomologists, with the Crabronidæ on account of its elongate, narrow form, and its petiolate, clavate abdomen, which gives it a superficial resemblance to the Crabronid genus *Rhopalum*. Structurally, however, it has no relations whatever with this or allied genera, differing widely in the structure of the head and in the venation of both pairs of wings.

Only two genera are known, separable as follows:

Table of Genera.

Front wings with two cubital cells, the second usually indistinctly defined; eyes deeply emarginate within.

Median and submedian cells in front wings of an equal length, the transverse median nervure being interstitial with the basal nervure; first recurrent nervure interstitial with the first transverse cubitus or nearly, the second recurrent received by the second cubital cell before the middle..... Aulacophilus, Smith.

Median cell in front wings distinctly longer than the submedian, the transverse median nervure joining the median vein *before* the origin of the basal nervure; first recurrent nervure uniting with the cubitus before the first transverse cubitus; second recurrent nervure rarely distinctly defined, usually indicated by a fuscous line or streak..... Trypoxylon, Latreille.

North American Species.

AULACOPHILUS, Smith.
TRYPOXYLON, Latreille.
T. politum, Say.
=albitarse, Auct.
=neglectum, Kohl.
T. albipilosum, Fox.
T. excavatum, Say.
T. projectum, Fox.
T. apicalis, Fox.
T. frigidum, Smith.
T. bidentatum, Fox.
T. rubricinctum, Pack.
T. rufozonalis, Fox.
T. arizonense, Fox.
T. californicum, Sauss.
T. spinosum, Cam., ♀ ♂.
T. texense, Sauss.
T. collinum, Smith.
T. carinatum, Say.
T. Johnsonii, Fox.
T. ornatipes, Fox.
T. fastigium, Fox.
T. pennsylvanicum, Sauss.
T. striatum, Prov.
T. sulcus, La Munyon.
T. unicolor, Beauv.
T. centrale, Cam.
T. cinereum, Cam.
T. mexicanum, Sauss.
T. aztecum, Sauss.
T. lactitarse, Sauss.
T. luteitarse, Sauss.
T. carinifrons, Cam.
T. fulvispina, Cam.
T. fulvipes, Cam.
T. balteatum, Cam., ♀.
T. apicipenne, Cam.
T. cinereo-hirtum, Cam., ♀.
T. fasciventre, Cam., ♀.
T. sonorense, Cam.
T. cornigerum, Cam.
T. chichimecum, Sauss.
T. toltecum, Sauss.
T. palliditarse, Cam.
T. rugifrons, Cam.

FAMILY XXII.—Mellinidæ.

This family, as well as those which are to follow, is distinguished from all of the preceding families *by having two apical spurs on the middle tibiæ*. From the other families having this character in common, namely, the Nyssonidæ, Stizidæ, Sphegidæ, and Ampulicidæ, it could only be confused with the family Nyssonidæ, subfamily Gorytinæ.

Unquestionably, the Mellinidæ and the Nyssonidæ have had a common origin and are exceedingly closely allied, but I believe both exhibit certain structural peculiarities, of taxonomic value, that justify one in keeping them separate and in treating them as distinct families.

In the Mellinidæ the first abdominal segment is usually long, petioliform, and coarctate, *or always with a decided constriction between the first and second segments*, the intermediate coxæ are contiguous, while the mesosternal suture is usually entirely wanting. In the Nyssonidæ, on the

contrary, the first abdominal segment may be long, but it is never coarctate, and there is never a constriction between it and the second segment, the middle coxæ are not quite so close together, and, as a rule, the *mesosternal suture is distinct* or *represented by a strong carina which separates the mesosternum from the mesopleura*. If this last character is not present, other quite distinct characters separate them.

The genera falling in this family may be distinguished by the use of the following table:

Table of Genera.

Cubitus in hind wings originating *beyond* the transverse median nervure 5.

Cubitus in hind wings *interstitial* with the transverse median nervure 4.

Cubitus in hind wings originating *before* the transverse median nervure.

Front wings with the second cubital cell receiving both recurrent nervures 2.

Front wings with the first and third cubital cells each receiving a recurrent nervure; submedian cell a little shorter than the median Mellinus, Fabr.

2. Submedian cell a little longer than the median 3.

Submedian and median cells equal, the transverse median nervure *interstitial* with the basal nervure, stigma not well developed, the radius originating from its apex Harpactostigma, Ashm., n. g.
(Type H. velutinus, Spin.)

3. Stigma well developed, rounded off at apex, the radius originating before its apex or near the middle, eyes very large, strongly convergent anteriorly on the clypeus.

First recurrent nervure received by the second cubital cell at its middle; abdomen with the dorsal segments depressed at apex Entomosericus, Dahlb.

First recurrent nervure received by the second cubital cell before the middle; abdomen with the dorsal segments not depressed at apex, normal Megalomma, Smith.

4. Stigma only moderately developed, the radius originating from its apex; submedian cell a little longer than the median; second cubital cell receiving both recurrent nervures; triangular area of metathorax well defined, striated; scutellum with a crenulate furrow across the base Hypomellinus, Ashm., n. g.
(Type G. rufocinctus, Fox.)

5. Front wings with the second cubital cell receiving both recurrent nervures 6.

Front wings with the first and second cubital cells each receiving a recurrent nervure, or the first recurrent is interstitial with the first transverse cubitus; stigma well developed, the radius originating from its middle; median and submedian cells equal, the transverse median nervure interstitial with the basal; tibiæ stout, clavate, spinous, the inner spur of hind tibiæ dilated..... Euspongus, Lepel.

6. Submedian and median cells equal; stigma large or well developed, the radius originating before its apex; hind tibiæ short, stout, spinous, the tarsi of normal length..... Olgia, Radz.

Submedian cell a little longer than the median; stigma not well developed, the radius originating from its apex; ♀ with a distinct tarsal comb; hind legs long, their tarsi fully twice as long as the tibiæ.

Head with the eyes not convergent on the clypeus, but convergent posteriorly; abdomen not or scarcely longer than the head and thorax united, the first segment strongly coarctate, dorsal segments *without* white pubescent bands at apex..... Mellinogastra, Ashm., n. g.
(Type G. mellinoides, Fox.)

Head with the eyes convergent on the clypeus, divergent posteriorly; abdomen longer than the head and thorax united, the first segment long, petioliform, subcoarctate, the dorsal segments banded with a whitish pubescence at apex..... Hapalomellinus, Ashm., n. g.
(Type G. eximius, Prov.)

North American Species.

(1) Mellinus, Fabr.
 (1) M. abdominalis, Cr., ♀ ♂.
 (2) M. bimaculatus, Pack., ♀ ♂.
 (3) M. rufinodus, Cr., ♀ ♂.
 (4) M. pygmaeus, Handl., ♀ ♂.
 (5) M. alpestris, Cam., ♀.
 (6) M. obscurus, Hdl., ♀.
(2) Harpactostigma, Ashmead.
(3) Entomosericus, Dahlbom.
(4) Megalomma, Smith.
(5) Hypomellinus, Ashmead.
 (1) H. rufocinctus, Fox, ♀.
 (2) (?) H. piceus, Hdl., ♂.
(6) Euspongus, Lepeletier.
 (1) E. bipunctatus, Say., ♀ ♂.
 (2) E. Championi, Cam., ♀.
(7) Olgia, Radoszkowski.
(8) Mellinogastra, Ashmead.
 (1) M. mellinoides, Fox, ♀.
(9) Hapalomellinus, Ashmead.
 (1) H. eximius, Prov., ♀ ♂.

A NEW SPECIES OF TINGITIDÆ.

BY OTTO HEIDEMANN, U. S. DEPT. OF AGRICULTURE, WASHINGTON, D. C.

Among the interesting species of Heteroptera which have been sent to the Division of Entomology by correspondents during the present season was a species of Tingitidæ which has not hitherto been described. In accordance with an established custom of the U. S. Department of Agriculture, the following description is submitted for publication in a periodical journal in preference to publishing it in a Departmental bulletin.

Gargaphia angulata, n. sp.

Oblong, narrower than other species of the genus Gargaphia, yellowish-white, translucent; body black beneath; posterior part of the rostral groove at the metasternum transverse. Head black, with three white, short but rather thick, obtuse spines in front between the antennæ. Antennæ slender, finely ciliated, testaceous, apical joint blackish; basal joint nearly twice as long as joint two; joint three very long, about four times as long as the apical. Pronotum dark, with three carinæ; the interspaces closely and finely punctate; the carinæ moderately foliaceous, testaceous, the median carina posteriorly whitish, tapering toward the apex of the reticulated membranous triangular portion of the pronotum; the membranous pronotal margin raised and moderately wide, angularly dilated behind the middle, with two rows of areoles at the narrow portion and with three areoles at the widest part, the areoles infuscated; pronotal hood small, oblong, somewhat compressed, with a sharp carina at the top, slightly projecting in front, leaving the eyes free; the hood, the three carinæ and the edge of the pronotal margin densely fringed with long, soft hairs. Hemelytra extending far beyond the abdomen, oblong-oval, broadly rounded at the apex, the sides abruptly converging to the base; subcostal and discoidal areas closely reticulated, the subcostal biseriate, the discoidal area comparatively narrow and not reaching the middle of the hemelytra, with three series of areoles at the widest part; the costal area rather broad, the areoles of irregular size, more or less hexagonal, except those along the exterior margin, which are either pentagonal or quadrate; the sutural area, but not the inner basal portion of it, has a few quite large areoles; three or four oblique blackish nervures at the costal area, and also some slightly darkened nervures at the apex of the hemelytra. Legs testaceous, with the tarsi blackish at the tip. On the rounded oval external genital plate of the male there is on both sides near the base a deep sunken point, the claspers at the apex are stout and hairy. Length, 3.4; width, 1.6 millim.

Described from several specimens found at Auburn, Ala., and District of Columbia (Heidemann). Type, No. 4371, U. S. Nat. Museum, from Auburn, Ala. A single specimen, probably from Missouri, and preserved in the collection of the U. S. Nat. Museum, is labeled in Prof. Uhler's handwriting: "Tingis angulata, Uhler, MS, on beans, Riley." I gladly accept Prof. Uhler's manuscript name.

This species is closely allied to *G. viridescens*, Champ., from Mexico and Texas, but differs by the angulated sides of the pronotum, by the larger number of areoles at the costal area, and the longer hairs at the edge of the pronotal margins and of the hood. It is also allied to *G. nigrinervis*, Stal., from Colombia and Mexico, but does not have the discoidal area of the hemelytra abruptly closed behind by a transverse oblique raised nervure.

BOOK NOTICES.

INSECTS: THEIR STRUCTURE AND LIFE—A Primer of Entomology.—By George H. Carpenter. London: J. M. Dent & Co. New York: The Macmillan Co., 66 Fifth Avenue. (Price, $1.75.) 404 pages.

This is a very satisfactory manual for the elementary study of entomology, and provides the student with all that he needs at first to know regarding the structure and general life-history of insects. The book is almost entirely a compilation from a large number of more elaborate and highly technical works, such as Dr. Packard's recent Text-book, Professors Miall & Denny's monograph on the Cockroach, and many others, but it is admirably put together and written in an easy and agreeable style. Its careful perusal will give the reader an excellent ground work for the pursuit of entomology, whether he proposes to apply himself to economic investigation or systematic study, or simply to the formation of a collection of insects. The book is divided into half a dozen chapters, the titles of which will give a good general idea of its contents, viz.: The Form of Insects, the Life-history, the Classification, the Orders, the Pedigree of Insects and their Surroundings. The illustrations, nearly two hundred in number, are very largely those with which we are familiar, the work of Dr. Riley and members of the staff of the Division of Entomology at Washington; others are from Miall & Denny's "Cockroach," and several English publications. They are a great help in elucidating the text, being well chosen for their clearness and excellence. The book may

very well be studied by college students and others taking a course in entomology; it will be found much simpler and easier to work through than Dr. Packard's larger and more elaborate treatise, but it will not be found of any use in the classification and identification of specimens, like Prof. Comstock's Manual, as this is not its object. Throughout the whole, it may be mentioned, the reader will observe its author's evidently strong views on the theory of evolution.

New Species of Lepidoptera.

Mr. Herman Strecker has recently published the second part of the Supplement to his "Lepidoptera: Rhopaloceres and Heteroceres, indigenous and exotic." It contains descriptions of three new species of butterflies and fifty moths; the former and a few of the moths are from regions outside the faunal limits of the United States and Canada. Two species are distinctively Canadian: *Therina fatuaria* from Montreal and *Ochyria Anticostiata* from the island of Anticosti. These Supplements will be quite as necessary to the student of Lepidoptera as the original work. They may be obtained from the author, P. O. Box 311, Reading, Penna. (Price, 25 cents each.)

Flashlights on Nature.— By Grant Allen; illustrated by Frederick Enock. Toronto: William Briggs, 29 Richmond Street West. (Price, 70 cents.) 312 pages.

Mr. Grant Allen's versatility as a writer is well known, but whatever opinion may be formed regarding his novels and tales of fiction, there can be no question that few authors can be compared with him when he devotes himself to natural-history subjects. His papers show that he must be a most minute and painstaking student of the wonders of plant and animal life, while at the same time his literary skill enables him to describe what he has seen and studied in a most charming manner and without any loss of scientific precision. He has also the able assistance of Mr. Enock, who is a well-known entomologist, and who evidently aids the author not only with his beautiful drawings, but with his careful observations as well. Most, if not all, of the papers in the volume before us have already appeared in the pages of a widely-circulated magazine, but they are well worthy of reproduction in this more permanent and convenient form. They treat of insects, birds, and plants, under such titles as the Cows that Ants Milk, a Plant that Melts Ice, a Beast of Prey

(Spider), a Woodland Tragedy (doings of a Butcher bird), Marriage Among the Clovers, the First Papermaker, etc. The closing paper, a Foreign Invasion of England, gives an admirable description of the life-history of the Hessian Fly. The illustrations, about a hundred and fifty in number, are very beautiful, and in clearness and excellence leave nothing to be desired. Anyone with a genuine love of nature cannot fail to be delighted with the book, and to derive from its perusal a knowledge of many things that were secrets to him before.

CORRESPONDENCE.

DERMESTES LARDARIUS (LINN.) IN HONEYCOMB.

In Dr. Lintner's Sixth Report of the Injurious Insects of the State of New York, 1890, mention is made of the fact that Dermestes lardarius was a wax-feeder. The only other reference to this habit of the insect was made by Dr. C. V. Riley, in the second volume of the American Entomologist for 1870.

A few days ago, while Mr. Ross, Fellow in the Bacteriological Department, was overhauling some brood comb which had been sent him for studying *foul brood*, he came across several adult beetles, many hairy larvæ, and moult skins, which he referred to me for identification. They all belonged to Dermestes lardarius. There is not good evidence, however, that they were feeding upon wax; but rather upon the dead larvæ and pupæ of Bee Moths (Galleria mellonella) which had established themselves in the honeycomb. On opening several cocoons of the Bee Moth, I found that the larvæ of Dermestes had possession of the old pupa-cases. The cocoons were all placed at right-angles to the direction of the honeycomb cells. Many large larvæ of Galleria were still to be found, and their silk-lined tunnels in the honeycomb were quite in evidence. A third suggestion is that the larvæ of Dermestes may prey upon the larvæ of the bee. In this case, however, I am of the opinion that the dead pupæ and larvæ of the Bee Moth formed the chief portion of the food of Dermestes. W. LOCHHEAD, Biological Dept. Ont. Ag. Coll.

JUSTUS W. FOLSOM, of Cambridge, Mass., received the degree of Doctor of Science from Harvard University at the last commencement. His thesis was based upon anatomical and embryological work among the Collembola and Thysanura.

P. H. ROLFS has accepted a position at Clemson College and Experiment Station, and has accordingly changed his address from Lake City, Florida, to Clemson College P. O., South Carolina.

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ENTOMOLOGICAL SOCIETY OF ONTARIO.

The thirty-sixth annual meeting of the Society was held in London on the 11th and 12th of October. On the former day a very interesting and important conference and discussion took place in the afternoon, on the San José Scale, which was participated in by Prof. James, Deputy Minister of Agriculture; Dr. Fletcher, Dominion Entomologist and Botanist; Mr. J. Dearness, one of the Special Commissioners on the Scale; Prof. Lochhead, Ontario Agricultural College; Prof. Webster, Wooster, Ohio; Mr. Fisher, Provincial Inspector; and others. A public meeting of a popular character was held in the evening, at which the President, Mr. Lyman, read his annual address, and Dr. Fletcher, Professors Webster and Lochhead, and the Rev. Drs. Fyles and Bethune took part. The second day was devoted to the general business of the Society and the reading and discussion of papers. A full account of the proceedings will be given in the annual report of the Society.

The following were elected officers for the ensuing year:—

President—Rev. T. W. Fyles, D. C. L., F. L. S., South Quebec.

Vice-President—Professor Wm. Lochhead, Ontario Agricultural College, Guelph.

Secretary—William E. Saunders, London.

Treasurer—J. A. Balkwill, London.

Directors: Division No. 1—W. H. Harrington, F. R. S. C., Ottawa.
Division No. 2—J. D. Evans, Trenton.
Division No. 3—D. G. Cox, Toronto.
Division No. 4—James Johnson, Bartonville.
Division No. 5—R. W. Rennie, London.

Directors ex-officio (ex-Presidents of the Society).—Professor Wm. Saunders, LL. D., F. R. S. C., F. L. S., Director of the Experimental Farms, Ottawa; Rev. C. J. S. Bethune, M. A., D. C. L., F. R. S. C., London; James Fletcher, LL. D., F. R. S. C., F. L. S., Entomologist and Botanist, Experimental Farms, Ottawa; John Dearness, I. P. S., London; Henry H. Lyman, M. A., Montreal.

Director ex-officio (Ontario Agricultural College).—Professor Wm. Lochhead, Guelph.

Librarian and Curator—J. Alston Moffat, London.

Auditors—J. H. Bowman and W. H. Hamilton, London.

Editor of the Canadian Entomologist—Rev. Dr. Bethune, London.

Editing Committee—Dr. J. Fletcher, Ottawa; H. H. Lyman, Montreal; J. D. Evans, Trenton; W. H. Harrington, Ottawa; Prof. Lochhead, Guelph.

Delegate to the Royal Society—Rev. Dr. Bethune, London.

Delegates to the Western Fair—J. Dearness and Dr. Bethune, London.

Committee on Field Days—Dr. Wolverton, Messrs. Balkwill, Bowman, Elliott, Law, Percival, Rennie, and Saunders, London.

Library and Rooms Committee—Messrs Balkwill, Bethune, Dearness, Moffat, and Saunders, London.

The following gentlemen were unanimously elected Honorary Members of the Society:

Dr. L. O. Howard, United States Entomologist, Washington, D. C.

Professor John B. Smith, Sc. D., Rutgers College, New Brunswick, N. J.

Professor F. M. Webster, Wooster Ohio.

Professor H. F. Wickham, Iowa City, Iowa.

SOME NEW DELTOCEPHALINÆ (JASSIDÆ).

BY E. D. BALL, FORT COLLINS, COLORADO.

Deltocephalus callidus, n. sp.

Form and general appearance of *signatifrons* nearly, more robust, venation slightly variable, resembling that of *compactus*. Length 3 mm.; width 1 mm.

Vertex obtusely angulate, one-sixth wider at base than its middle length, scarcely equalling the pronotum; front long and narrow, but slightly wider than clypeus below; pronotum more than twice wider than long; elytra equalling the abdomen, rather broad, outer claval area slightly reticulated, central anteapical cell usually divided.

Colour: pale creamy white, vertex with a triangular spot either side the apex, an interrupted bar before the ocelli and an ocellate spot on either side at the base, fuscous or black; pronotum irregularly marked with olive and fuscous; elytra with the nervures light, margined with

brownish fuscous, interrupted on a distinct band across the second cross-nervure and the first apical veinlet; below dark, the lower half of face light, with the sutures and a spot on the clypeus fuscous.

Genitalia: female, ultimate ventral segment convex, one-third longer than penultimate, posterior margins roundingly emarginate from the acute lateral angles, produced on the middle third into a rounded process which is triangularly notched at the apex, lateral angles light, median process black.

Described from three female specimens from Pullman, Wash. (C. V. Piper).

Deltocephalus ordinatus, n. sp.

Similar to *collinus* in form, but with a shorter vertex, vertex shorter than in *Melsheimeri*. Pale straw yellow with brownish olive markings. Length 3.5–4 mm; width 1.5 mm.

Brachypterous form: vertex slightly obtusely angulate, the margin blunt and rounding, one third longer on middle than against eye, as long as the pronotum, slightly wider than long; face as in *collinus*, front rather broad, lateral margins convex; pronotum broad, but slightly emarginate posteriorly; elytra broad and short, exposing the two last abdominal segments, apex evenly rounding from both sides, the apical cells very short; wings rudimentary.

Macropterous form; vertex longer, right-angled; elytra and wings exceeding the abdomen, apical cells long, the appendix present, central anteapical cell long and parallel margined.

Colour: vertex with the lateral margins and a median stripe, widening posteriorly, pale straw yellow, the disc on either side brownish olive; pronotum with four brownish stripes; elytra pale subhyaline yellowish, more or less of the fuscous on the sides of the abdomen showing through; face pale olive with lighter arcs, below pale yellow.

Genitalia: female, ultimate ventral segment equalling the penultimate, posterior margin roundingly emarginate for one-third the distance from the lateral angles, then produced into a pair of slightly divergent, acutely angular processes between which is a short rounding tooth.

Described from six females from Marshall's Pass and one from Ft. Collins, Colo., all taken by Prof. Gillette.

Deltocephalus paludosus, n. sp.

Somewhat resembling *auratus*, but with the elytra flaring rather than compressed. Colour lemon yellow in female, greenish yellow in male.

Elytra with black spots either side of the apex. Length 3.5–4 mm; width 1 mm.

Vertex roundingly rectangular, the margins obtusely rounding, apex subconical, length and width about equal, shorter than the pronotum; pronotum twice wider than long, broadly produced between the eyes, posterior margin nearly straight; elytra equalling the abdomen in the female, slightly longer in the male; venation as in the female of *auratus*, the second cross nervure seldom present.

Colour: female pale lemon yellow, the eyes deep green or fuscous, a spot in the second apical and another in the anal cell, and sometimes a line around the apex fuscous; male greenish yellow, the face and vertex sometimes orange, eyes and a spot in each apical cell fuscous, those in the third and fourth coalescing into a line on the margin.

Genitalia: female; ultimate ventral segment equalling the penultimate, the lateral angles somewhat produced, between which the posterior margin is nearly truncate, a large median triangular notch, either side of which there is a black spot. Male: valve long, the apex rounding, plates as broad at the base as the ultimate segment, regularly narrowing to one-half that width at their truncate apices, width at base and length about equal, margins reflexed and armed with stout hairs, a fuscous spot on the tip of each plate and a small black one before it.

Described from twenty-five specimens taken from Carex, Ft. Collins, Colo.

Deltocephalus castoreus n. sp.

Short compact, with a short conical vertex. Black, with light markings on vertex and three subhyaline light bands on elytra. Length 2.5 mm; width 1 mm.

Vertex conical, obtusely angulate, equalling the pronotum, its basal width one-third greater than its length on middle, anterior margin roundingly narrowing to the broad convex front, which is roundingly narrowing below to the broad parallel margined clypeus; clypeus two-thirds the length of the front; elytra broad, evenly rounded behind, with a broad, short appendix, covering the abdomen in the male, a little shorter in the female; venation obscure except on the hyaline areas, clavus not reticulated, central anteapical cell short, not divided.

Colour: vertex shining black, a small circle around tip, connected with the ocelli by a slender line, and a broad irregular mark at base light yellow; pronotum black, with a tri-lobate yellow mark along the posterior

margin ; scutellum black ; elytra shining black with an indistinct light band extending from the point of the scutellum obliquely across the first cross-nervure of corium, another band from the apex of clavus transversely across the second cross-nervure, and a third along the apical margin ; below shining black, the margins of the genæ and the spines on the posterior tibiæ orange.

Genitalia : female, ultimate ventral segment half longer than penultimate, posterior margin rounding, slightly excavated, with a small median tooth ; male valve broad, triangular, the margins membranous except at the tip ; plates as broad as the ultimate segment, slightly convexly narrowing two-thirds their length, then curved slightly upwards and extending into a broad finger, the whole three times the length of the valve, equalling the pygofers.

Described from one male and one female from the head waters of the Little Beaver (9,500 ft. alt.), Larimer Co., Colo.

Deltocephalus satur, n. sp.

Resembling *compactus*, smaller, scarcely larger than *blandus*, with a shorter vertex. Olive brown with light and fuscous markings. Length : ♀ 2.5 mm., ♂ 2 mm.; width 1 mm.

Macropterous form : vertex convex, sloping, narrowing posteriorly, where it equalls the middle length, slightly shorter than pronotum, slightly obtusely angulate, the apex produced, conical ; face convex, front large, lateral margins rounding, clypeus long and prominent ; elytra slightly longer than abdomen in both sexes ; venation similar to *compactus*, inner claval vein approaching the outer and connected by two cross-nervures, outer margin of clavus irregularly reticulated, central anteapical cell divided, the dividing nervure being beyond the apex of clavus. Brachypterous form : elytra short, obliquely truncate, exposing the ultimate and most of the penultimate dorsal segments, apical cells minute, posterior part of central anteapical minute or wanting.

Colour : vertex olive brownish, a light band between the ocelli, another along the anterior margin, these coalescing, omitting a triangular spot either side the apex and a fuscous one inside the ocellus on either side, an oblique fuscous dash on either side near the base ; pronotum olive brown with a submarginal row of fuscous spots and subobsolete light stripes ; elytra subhyaline, the nervures broadly light, irregularly, narrowly margined with fuscous, a spot on the centre of costa, the inner anteapical cell and the second apical, fuscous or black.

Genitalia: female, ultimate ventral segment nearly four times wider than long, posterior margin slightly emarginate with a short broad median tooth; male valve broad, short; plates broad at base, concavely, attenuately pointed, two and one-half times longer than valve, equalling the pygofers, which are thickly beset with stout hairs.

Described from two females and two males from Holly, Colo. The small size and the black spot near the anal angle of the elytra at once distinguish this species.

Lonatura salsura, n. sp.

Form and general appearance of *catalina*, but much larger. Pale sordid yellow. Length: ♀ 4.5 mm., ♂ 4 mm.; width 1.25 mm.

Macropterous form: vertex broad, obtuse, convex, one-half longer on middle than against eye, one-third wider than long, anterior margin rounding; front very broad above, rapidly roundingly narrowing to the long parallel margined clypeus; pronotum one-fourth longer than the vertex, as wide as the eyes; elytra slightly longer than the abdomen in both sexes, broadly overlapping behind clavus, appendix well developed, nervures indistinct, veins on clavus connected, anteapical cells very long, parallel margined, their apices truncate.

Brachypterous form: as above except that the abdomen is elongate and the elytra very short, truncate, only covering the first abdominal segment, the exposed part being one-half the whole length of the insect.

Colour: pale sordid straw in the brachypterous form, macropterous form washed with brownish olive on the head and pronotum, tergum fuscous, partly visible through the hyaline elytra; below dark fuscous except the face. In dark specimens, there are a pair of spots at the apex and an oblique pair near the base of the vertex.

Genitalia: female, ultimate ventral segment slightly emarginate either side of a prominent median tooth, which is as long as its basal breadth, the lateral angles deeply excised, displaying a rounding lobe of a membrane beneath; male valve rounding, almost concealed by the ultimate segment, plates concavely acuminate, longer than ultimate segment, equalling the pygofers.

Described from numerous specimens collected at Ft. Collins and a few from Holly and the Little Beaver, Colo.

COLEOPTERA IN SEPTEMBER.

Stone-turning on the hillsides and in the woods, usually productive late in the season, gave very poor returns this year. However, on September 17th, a brother entomologist and the writer visited a locality which would satisfy the most exacting collector. Where the Chicopee River empties into the Connecticut, a depression in the low meadow-land marks the course of a former branch of the river. The spot is well wooded with poplars, willows and maples, in whose dense shade

a rank undergrowth thrives. Early in the season a pool of water, left by the spring inundation, occupies the deeper part of the old watercourse, but disappears in the course of the summer. However, the ground remains moist and muddy throughout the season. Here we found beetles fairly swarming. Carabidæ and Staphylinidæ were running over the ground everywhere, and every bit of debris, hole and crevice sheltered them. Most of the specimens taken belonged to the two families mentioned, but several species of Scarabæidæ, Chrysomelidæ and weevils, driven to shelter by the early frosts, were also found. Carabidæ occurred in considerable variety, Bembidiums, of course, predominating. The species of this genus which most pleased us was the handsome B. postremum, which the writer had not seen alive for many years. It is a showy species with highly-polished green surface and a couple of light patches on the elytra. It runs most rapidly when alarmed, but does not take flight like so many others of its genus. On some circumscribed patches of ground it was quite numerous, and scampered out from nearly every bit of litter that was disturbed, or peeped from holes in the ground, while only a few paces away none were to be found. It seemed to prefer the places where the weeds were densest, while in more open spots the less conspicuous species, as B. dorsale, B. variegatum, B. flavopictum, etc., abounded. Running over the mud a few Elaphrus ruscarius were taken. Under debris a number of Carabus vinctus and a few of the pretty, though minute, Dyschirius hæmorrhoidalis. Perhaps the most abundant beetle was Platynus anchomenoides. It was found wherever the herbage was turned aside. In this connection may be mentioned this beetle's curious habit of feigning death when thrown on its back, although otherwise very lively. Occasionally an Omophron was found under a fallen leaf or bit of twig, and they increased in numbers as we approached the open ground lately occupied by the pool. Here they were found under debris and by digging just beneath the surface of the soil. The pressure from our feet, as we moved about, drove them from their burrows, and they could be seen emerging close to us, while several were generally in sight running over the ground. An old dust-broom, which happened to be at hand, gave excellent service at this juncture. By sweeping the ground and thus exposing the burrows, the beetles were taken literally by hundreds. This was highly satisfactory, as in my search of former years along sandy shores, I had found them very sparingly. FREDERICK KNAB, Chicopee, Mass.

A LIST OF MANITOBA MOTHS.—Part IV.

BY A. W. HANHAM, WINNIPEG, MAN.

(Continued from page 206).

Hadenella subjuncta, Smith. A few at light in 1897 about the beginning of July. (See page 323, Vol. XXX.)

Drybota stigmata, Grt. Cartwright.

Polia confragosa, Morr. Sept. 15th (1896). Three specimens at sugar in Elm Park.

Laphygma frugiperda, S. & A. Sept. 8th, one at bloom.

Eupsephopœctes procinctus, Grt. Cartwright. I think Mr. Heath has only taken one of these fine insects.

Trigonophora periculosa, Gn. Cartwright.

Brotolomia iris, Gn. June 19th, etc., several at light, also taken resting on walls of house.

Euplexia lucipara, Linn. June 18th to middle of July, a few at light.

Nephelodes minians, Gn., and var. violans, Gn. Rather rare here apparently ; taken at light and on the wing, August 21st to September 9th.

Tricholita semiaperta, Morr. Occasional at light towards the end of July.

Helotropha reniformis, Grt., and var. atra, Grt. A common moth at sugar from middle of August until middle of September.

Hydrœcia sera, G. & R. Sept. 23rd (1897), one at light.

" juvenilis, Grt. A pair in July.

Hydrœcia atlantica, Smith. A somewhat variable species and common. Taken at bloom, at light, and at sugar (rarely) from middle of July to the middle of September.

Hydrœcia interoceanica,* Smith. Winnipeg.

" verona, Smith. Winnipeg.

Hydrœcia obliqua, Harv. Rare at light, end of July (only one ♀ taken). Also at Brandon.

Hydrœcia cerina, Grt. One at light on 21st September (1897).

Hydrœcia purpurifascia, G. & R. Mr. Heath seems to have found this species not uncommon. I took one in Elm Park by beating dead leaves on bough, September 26th (1896).

Hydrœcia rutila, Gn. Cartwright.

" immanis, Grote. Cartwright.

*Among the specimens of nictitans‡, = *atlantica*, Sm., received from Mr. Hanham were three small, very dark specimens, without date or other label save "Winnipeg." These proved distinct and were described in Trans. Am. Ent. Soc., XXVI, 17, May, 1899. J. B. Smith.

Hydrœcia frigida, Smith. One at light here on September 16th, also taken by Mr. Heath.

Hydrœcia nelita, Streck. Cartwright.

Hydrœcia appassionata, Harv. A beauty at light on September 22nd (1898).

Nonagria, sp. I have taken two specimens here at light, one August 31st (1897), the other August 14th (1898), and I have seen the same species from Brandon and Cartwright. (Prof. Smith says concerning Nonagria, that the species are absolutely undetermined in collections.)

Senta defecta, Grt. In 1897 this species was very numerous at light on July 19th, and stray individuals were seen several nights following, but in 1898 not a single specimen was taken.

Tapinostola variana, Morr. July 20th (3), 24th (1). Altogether about a dozen were taken, all at light, the others being found dead lying about the floor and shelves of my room. Also taken at Brandon and Cartwright.

Leucania pallens, Linn. Taken during July and August. Very common in July at light.

Leucania albilinea, Hbn. June 19th, etc., several at light.

" phragmatidicola, Gn. July, not uncommon at light.

Leucania commoides, Gn. Common at light in July, and very plentiful at bloom at Brandon in 1896, about the middle of the same month.

Leucania juncicola, Bdv. One at light, September 24th (1897.)

" insueta, Gn. June 18th, one at light ; also from Cartwright.

Leucania unipuncta, Harv. Occasional at light, and at sugar from the middle of August until end of season. This species is usually a lively one at sugar, and a nuisance, driving off other things.

Ufeus plicatus, Grt. Cartwright, Douglas and Rounthwaite. Mr. Marmont says that Mr. Criddle, of Aweme, informed him that examples of this species were often captured in their house during the winter.

Nolophana malana, Fitch. Cartwright.

Caradrina miranda, Grt. Fairly common at light from middle of June into July.

Caradrina meralis, Morr. A pair at Brandon on September 1st, either at bloom or sugar.

Caradrina extimia, Walk. (= civica, Grt). Particularly common off bloom at Brandon during August. Also taken at light from 20th of July on.

Caradrina punctivena, Smith. Common at light from middle to end of July.

Pyrophila tragopoginus, Linn. One in 1895, not seen since.

Pyrophila pyramidoides, Gn. Common at sugar in Elm Park in 1896, from August 18th to middle of September.

Orthodes cynica, Gn. Rare here at light.

" crenulata, Smith. Occasional at light during June.

Tæniocampa thecata, Morr. (No. 2335.) Cartwright.

" oviduca, Grt. One or two at light, May 22nd, etc.

Tæniocampa pacifica, Harv. Plentiful with Mr. Heath. I got one or two at light early in May.

Tæniocampa alia, Gn. Cartwright.

Tæniocampa subterminata, Smith. Brandon. Mr. Boger has a specimen of this rather handsome species.

Calymnia orina, Gn. Brandon. Three specimens at sugar on August 21st (1897). One here at light August 6th, also from Cartwright. Prof. Smith says this is quite a variable species.

Cosmia infumata, Grt. Another very variable species. Comes freely to sugar and light, middle of August to end of September.

Parastichtis discivaria, Walk. This variable species is not uncommon at light, middle of July to middle of August, and I have often met with it during the day at rest on golden-rod.

Ipimorpha pleonectusa, Grt. Both seasons at light from middle to end of July, but not common.

Pyrrhia exprimens, Walk. Not uncommon at light in 1897, rather rare last season. End of June until middle of July. This species, too, has quite a range of variation.

Orthosia ferruginoides, Gn. Taken both at light and at sugar, out during part of August and September. A fresh specimen that I took at sugar on September 15th (1896) was so pale that I was sure I had taken a new species until I referred it to Prof. Smith.*

Orthosia euroa, G. & R. Occasional at light and at sugar during August, into September. On August 10th (1896), by sweeping Canada thistle heads after dark I could have taken hundreds of this species. The thistles were in a clearing among bush at River Park, near the city.

*This specimen was probably *decipiens*, Grt., which I had not recognized as distinct until the recent receipt of good material. (J. B. S.)

Orthosia Conradi, Grt. Occasional here at light towards end of July. During the same month at Brandon in 1896 this was one of the common things on the wing about dusk.

Orthosia lutosa, Andr. July 12th (1898), one or two at light; also from Cartwright.

Homoglæa hircina, Morr. This early species was met with first this season. On April 14th and 15th I took a couple of dozen at light. These were easily divided into three forms or varieties.

Glæa inulta, Grt. Occasional at light, and one of the most plentiful species at sugar, end of August to end of season (October).

Xanthia flavago, Fabr. End of August to end of September. Taken at sugar, at bloom and at light, also by beating.

Cirrœdia pampina, Gn. Common at sugar from middle of August until well on in September, comes to light. A somewhat variable species.

Scoliopteryx libatrix, Linn. Plentiful at sugar in Elm Park on Sept. 15th (1896). Taken as early as the 1st. Last season I took a specimen at light on May 20th.

Scopelosoma tristigmata, Grt. At sugar and light.
" Walkeri, Grt. At sugar and light.
" sidus, Gn. At sugar and light.

Scopelosoma devia, Grt. Two at sugar and another taken under a log on April 22nd (1894), the latter being a beautifully fresh specimen. I have taken these Scopelosomas at sugar from September 15th into October, also a few individuals in the spring at light; none of them have been taken in any numbers. Walkeri appear to vary considerably.

Litholomia napæa, Morr. Frequent at light during September.

Xylina disposita, Morr.
" petulca, Grt.
" signosa, Walk.
" Bethunei, G. & R.
" contenta, Grt.
" Georgii, Grt.
" laticinerea, Grt.
" pexata, Grt.

At sugar from middle to end of September, also at light (September and May) and by beating. Pexata seems to be rare here, and of the others, the only really common species is laticinerea. Xylinas are often met with sitting on fences. On August 10th two pupæ were found under the bark of a stump, producing Bethunei at end of month.

Xylina Thaxteri, Grt. I have not taken this species at sugar, my three specimens all being captured off fences.

Xylina capax, G. & R. A pair at light on September 1st (1897).
" carbonaria, Harv. Cartwright.

Morrisonia vomerina, Grt. May 17th (1898), three specimens at light.

Xylomiges dolosa, Grt. Rare. Brandon and Rounthwaite.

Lithomia germana, Morr. Quite common in 1896 at sugar from August 27th to end of September, and has been taken at light.

Calocampa nupera, Lint.

" cineritia, Grt.

" curvimacula, Morr.

These three species have been taken at sugar in about equal numbers; nupera as early as the end of August, and a couple of weeks at least before the others. All have come to light, and I have taken nupera, if not the others, again in the spring, and also under a log (May 24th).

Cucullia asteroides, Gn. Quite rare, taken sitting on fence early in the summer.

Cucullia florea, Gn. Our common species at light during July; a specimen taken as late as September 1st, at rest on fence.

Cucullia Speyeri, Lint. One at Brandon at bloom about the middle of July.

Cucullia intermedia, Speyer. June 27th, July 12th, etc., an occasional specimen at light and on fences.

Cucullia albida, Smith. Mr. Marmont found this good species rather plentiful at Rounthwaite last season, and I got one in my house on May 18th.

Asteroscopus borealis, Smith. Cartwright. (See page 25 of present volume for description of this new species).

Ogdoconta cinereola, Gn. Several at light in 1897 about the middle of July.

Abrostola urentis, Gn.
Deva purpurigera, Walk. } Occasional at light, both seasons, early in July; the latter was also taken off prairie flowers at Brandon in 1896.

Plusia ærea, Hbn. July 13th. I have never taken more than a single specimen of this species in Manitoba, though so common in the East.

Plusia æreoides, Grt. With the exception of simplex, our commonest Plusia, especially so at light during July in 1897.

Plusia balluca, Geyer. At light, August 3rd, etc., rare.

Plusia Putnami, Grt. Plentiful at light in 1897, early in July, and one taken as late as September 1st; rare in 1898. A pupa was found quite exposed on June 10th in a white loose cocoon attached to a weed.

Plusia striatella, Grt. (= venusta, Wlk). Over 60 specimens were taken in 1897 at light, from June 27th into August. Last season only four were seen.

Plusia thyatiroides, Gn. Rare, 5 specimens taken off Heliopsis scabra in Elm Park on August 18th and 24th (1896), and another off Cnicus Canadensis on August 15th (1895).

Plusia bimaculata, Steph. Not infrequent at light both seasons towards the end of July.

Plusia biloba, Steph. One captured at Brandon on July 23rd (1896), off Cnicus undulatus.

Plusia precationis, Gn. Quite rare here, only 2 or 3 specimens taken at bloom, July 25th, August 11th, etc.

Plusia californica, Speyer. Only taken in 1895, two at bloom in my garden on July 29th, and another at light on the 30th.

Plusia brassicæ, Riley. One, July 30th (1895), in my garden. An unusually dark form of this species has been taken by Mr. Boger at Brandon.

Plusia viridisignata, Grt. (Dr. R. Ottolengui informs me that this is really (2632) selecta, Walk). July 19th, one at light in 1897.

Plusia epigæa, Grote. August 25th, one at bloom.

Plusia ampla, Walk. I have taken this specimen at light from the 22nd of June until July 12th, and in fair numbers.

Plusia simplex, Gn. A pale form of this species occurs here. The species is double-brooded, or appears to be on the wing throughout the summer; it was very plentiful on the prairie at Rounthwaite on September 11th last. Have only taken one specimen at light.

Plusia flagellum, Walk. (monodon, Grt., and insolita, Smith, are, Dr. Ottolengui tells me, identical). I first took this species at Brandon, at bloom on July 15th, 1896; the two following seasons it has come to light here from June 24th into July, some half dozen specimens being captured.

Calpe Canadensis, Beth. Only from Cartwright.

Plusiodonta compressipalpis, Gn. One on the wing when sugaring in Elm Park on August 27th (1896). Some years back, when living in Hamilton, Ont., I bred a number of these moths from numerous larvæ found feeding on moonseed (Menispermum Canadense). This vine covered the veranda of the house in which I lived. The larvæ taken early in July were full-grown and very beautiful; a second brood appeared about the middle of August.

Stibadium, sp. Several specimens of the same species were taken at light about the middle of July (1897); all were destroyed in the mails.

Heliothis phlogophagus, G. & R. Cartwright.

Alaria florida, Gn. Aweme, Cartwright and Rounthwaite.

Schinia cumatilis, Grt. Brandon and Cartwright. I took one at light at Brandon on August 20th (1897).

Schinia Meskeana, Grt. Brandon. I think Mr. Boger took a pair in 1896.

Dasyspoudæa lucens, Morr. Rounthwaite. Two or three were captured by Mr. Marmont, all the same season.

Dasyspoudæa Meadii, Grt. One specimen only in 1897, came to light on July 1st. A beautiful moth and in perfect condition.

Melaporphyria immortua, Grt. Rounthwaite.

" ononis, Fabr. Brandon and Rounthwaite.

Acontia erastrioides, Gn. } Taken from middle of June into July;
" candefacta, Hbn. } neither species abundantly.

Spragueia inornata, Grt. Common on the prairies, on the wing during the day, in June and again in August.

Metathorasa monetifera, Gn. One at light, July 2nd (1897).

Lithacodia bellicula, Hbn. June 9th into July. A common day flier on the prairies.

Erastria albidula, Gn. Plentiful at light, etc.

" synochitis, G. & R. Common in Elm Park, at rest on trees.

" muscosula, Gn. Rare here, one or two specimens taken.

" carneola, Gn. Common at light, etc.

Erastria includens, Smith. One here several years ago, and from Cartwright.

Galgula hepara, Grt. One here in 1894.

Drasteria erechtea, Cram. This very variable moth appears to be out during the whole season. I have taken it early in May, and fresh specimens as late as October.

Drasteria erichto, Gn. This species is not nearly so plentiful.

" distincta, Neum. Not common. June 12th to 19th.

Euclidia cuspidea, Hbn. One of our earliest day fliers, and too plentiful at light last June.

Melipotis limbolaris, Geyer. Brandon, Cartwright aud Rounthwaite.

Catocala grynea, Cram. Aweme.

Catocala præclara, G. & R. One at light, August 4th (1898), also from Cartwright.

Catocala Clintonii, Grt. Single specimens at light, July 14th and 20th (1898).

Catocala coccinata, Grote. July 21st to August 10th, a few at sugar in my garden.

Catocala parta, Gn. August 18th into September, at sugar in Elm Park in 1896, also seen from Brandon and Cartwright.

Catocala unijuga, Walk. Out with parta, but less local.

Catocala briseis, Edw. A somewhat variable species. Taken at light as early as July 12th, and at sugar until middle of September.

Catocala concumbens, Walk. Taken plentifully at light and at sugar. Is out in July and I have taken it at sugar on October 3rd. This is our common species in Manitoba.

Catocala aspasia, Strk. (3056 B) Cartwright.

Catocala relicta, Walk. Taken at light, August 4th, etc., and at sugar until middle of September. Fairly plentiful.

Zale horrida, Hbn. One at light here on May 24th (1898).

Pheocyma lunifera, Hbn. One at light on May 23rd (1898).

Homoptera edusa, Dru. (var. B). One bred from pupa, evolved in April.

Homoptera minerea, Guen. Cartwright.

" obliqua, Gn. A pair at light on May 25th (1898).

Homopyralis tactus, Grt. Occasional at light.

Spargaloma sexpunctata, Grt. Rare, only a pair taken

Pseudaglossa lubricalis, Geyer. Cartwright.

Helia borealis, Smith. A pair taken at light in 1897.

Epizeuxis aemula, Hbn.
" americalis, Gn.
" goasalis, Walk.
} All fairly plentiful at light in July.

Hormisa orciferalis, Walk. (= Sisyrhypena pupillaris, Grt.) A pair here at light on July 20th (1898).

Megachyta deceptricalis, Grt. A pair at light in July.

Litognatha rubilifascia, Grt. One here at light.

Herminia morbidalis, Gn. Taken at light, etc.

" petrealis, Grt. Taken at light, etc.

Zanclognatha laevigata, Grt.
" ochreipennis, Grt.
" obscuripennis, Grt.
} Taken at light, etc.; none commonly.

Zanclognatha Hanhami, Smith. Common at light in 1897, rare in 1898, middle to end of July.

Pallachira bivittata, Grt. July 7th, etc. (1897), six examples, none seen in 1898.

Philometra longilabris, Grt.
" eumelusalis, Walk. } Both species seem rare here.

Rivula propinqualis, Gn.
Palthis angulalis, Hbn.
Phalenophana rurigena, Grt. (3254) } All are common species in Elm Park and they have been taken at light.

Capis curvata, Grt. Rounthwaite.

Renia flavipunctalis, Geyer. One of our most common "snouts."

Bleptina caradrinalis, Gn. Another common species.

Bomolocha scutellaris, Grt. Elm Park, July.
" bijugalis, Walk. Elm Park, July, not uncommon.
" toreuta, Grt. A pair taken. Elm Park.
" sordidula, Grt. A pair taken. Elm Park.
" profecta, Grt. Elm Park, July, rare.
" deceptalis, Walk. Only one taken.

Hypena humuli, Harr. Not uncommon.

Hypena scabra, Fabr. Worn examples taken on the wing in the spring; a common species, have taken it late at sugar.

Hypena edictalis, Walk. Not uncommon in Elm Park.
" eductalis, Walk. (=3277). One specimen taken.

(To be continued.)

LIST OF COLEOPTERA FROM HALIFAX, N. S.

BY J. D. EVANS, TRENTON, ONT.

The beetles enumerated below were taken in 1897, some of them while the writer visited that city on the occasion of the annual meeting of The Royal Society of Canada, in June. Unfortunately, the weather was most unpropitious for insect hunting until the last day, when quite a number were taken, and later on in the season the list was increased by captures made by a brother, resident of the city.

While some of the species were well represented, very many were by only one or two specimens, and in a few cases by three or four. I feel very grateful to Prof. H. F. Wickham for kindly determining many of the species.

Cicindela 12-guttata. Dej.
Loricera cærulescens, Linn.
Corymbites tarsalis, Melsh.
Asaphes memnonius, Hbst.

Bembidium lucidum, Lec.
" scopulinum, Kirby.
Pterostichus lucublandus. Say. Common.
Pterostichus convexicollis, Say.
" mutus, Say.
Amara exarata, Dej. Common.
Amara pallipes, Kirby.
var. depressus, Lec.
Amara impuncticollis, Say.
" sp. Common.
Platynus extensicollis, Say.
" cupripennis, Say.
" placidus, Say.
" obsoletus, Say.
Chlænius sericeus, Forst.
Harpalus viridiæneus, Beauv. Common.
Harpalus fallax, Lec.
" basilaris, Kirby.
Anisodactylus rusticus, Say.
Cercyon hæmorrhoidalis, Fab.
" sp.
Silpha surinamensis, Fab. Common.
Silpha lapponica, Hbst.
Anthobium, sp.
Adalia bipunctata, Linn.
Læmophlœus convexulus, Lec.
Peltis ferruginea, Linn.
Cyphon variabilis, Thumb.
Monocrepidius auritus, Hbst.
Agriotes mancus, Say.
" limosus, Lec.
Dolopius lateralis, Esch.
Betarmon bigeminatus, Rand.
Melanotus fissilis, Say.
Corymbites cylindriformis, Hbst.
" spinosus, Lec.
Agrilus fallax, Say.
" politus, Say.
Ellychnia corrusca, Linn.
Podabrus, 2 sp.
Telephorus fraxini, Say.
" lineola, Fab.
Thanasimus nubilus, Kl.
Platycerus depressus, Lec.
Onthophagus nuchicornis, Linn. Common.
Aphodius fossor, Linn. Common.
" fimetarius, Linn.
" ruricola, Melsh.
" erraticus, Linn.
Diplotaxis tristis, Kirby.
Trichius affinis, Gory.
Phymatodes dimidiatus, Kirby.
Hyperplatys maculatus, Hald.
Donacia proxima, Kirby.
Bassareus sellatus, Suffr.
Cryptocephalus 4-maculatus, Say.
Chrysomela elegans, Oliv.
*Chrysomela staphylea, Linn. ? One sp. only.
Trirhabda tomentosa, Linn. Common.
Haltica bimarginata, Say.
Isomira quadristriata, Coup.
Cistelidæ gn. sp.
Melandryadæ " "
Salpingus virescens, Lec.
Nacerdes melanura, Linn.
Anaspis rufa, Say.
Attelabus rhois, Boh.
Lepyrus colon, Linn.
Hylobius confusus, Kirby.
Anthonomus corvulus, Lec.
" cratægi, Walsh.
Dendroctonus terebrans, Olio.

*This Chrysomela is very near the European Staphylea, Linn., if it is not the same. Comparing it with one specimen from Europe, the Nova Scotian insect is larger, being .32 in., as compared to .26 in., the length of the one from Europe. The thorax of the European insect is more densely, and the elytra much more coarsely, punctured than in the N. S. insect.

CLASSIFICATION OF THE ENTOMOPHILOUS WASPS, OR THE SUPERFAMILY SPHEGOIDEA.

BY WILLIAM H. ASHMEAD, ASSISTANT CURATOR, DIVISION OF INSECTS, U. S. NATIONAL MUSEUM.

(Paper No. 6.)

Family XXIII.—Nyssonidæ.

Anyone with the use of my table of families ought readily to recognize any wasp falling in this family, and especially after reading my remarks under the family Mellinidæ. The only group that could possibly cause trouble or confusion would be the subfamily *Gorytinæ*, which closely resembles the *Mellinidæ*, but which may be easily separated from the latter by paying close attention to the shape of the first abdominal segment and examining the mesopleura for the mesosternal suture or carina.

The family Nyssonidæ may be divided into four distinct groups, which I have designated as subfamilies, and which are easily distinguished by the characters made use of in the following table :

Table of Subfamilies.

Marginal cell always pointed at apex, never truncate, and without an appendage; antennæ inserted far above the clypeus, always away from the clypeal suture.

Front wings with the second cubital cell broadly sessile, never triangular or petiolate, and receiving both recurrent nervures; mesopleural furrow usually deeply and sharply defined, complete Subfamily I., Gorytinæ.

Front wings with the second cubital cell petiolate, rarely triangular, sessile; mesopleural suture wanting or subobsolete, evanescent posteriorly.

Metathorax with the superior hind angles unarmed, rounded or obtuse; pronotum dorsally not short, subquadrate; forms elongate Subfamily II., Alysoninæ.

Metathorax with the superior hind angles always acute or produced into stout teeth or spines; pronotum dorsally short, narrowly transverse; forms broad, robust Subfamily III., Nyssoninæ.

Marginal cell always broadly truncate at apex, with an appendage; antennæ inserted close to the clypeus, or very close to the clypeal suture Subfamily IV., Astatinæ.

Subfamily I.—Gorytinæ.

This subfamily approaches nearest to the Mellinidæ and is the only one that could possibly be confused with it. The characters of the first abdominal segment and of the mesopleura, already pointed out, will, however, readily separate it from the Mellinidæ.

From the other subfamilies, into which this family is divided, it is separated by the *sessile second cubital cell*, and, as a rule, by the distinct mesosternal suture.

The genera are somewhat numerous and closely allied, but may be distinguished by the use of the following table:

Table of Genera.

Mesosternum not separated from the mesopleura by a longitudinal suture or carina, the latter entirely wanting or indicated only slightly anteriorly; cubitus in hind wings originating *beyond* the transverse median nervure, very rarely interstitial or nearly 4.

Mesosternum always distinctly separated from the mesopleura by a longitudinal suture or carina (sometimes difficult to discern on account of the pubescence).

Cubitus in hind wings originating *before* the transverse median nervure, or interstitial or nearly 2.

Cubitus in hind wings originating *far beyond* the transverse median nervure; stigma not well developed, the radius originating from its apex 3.

2. Cubitus in hind wings originating *far* before the transverse median nervure.

Triangular area of metanotum sharply defined by grooved lines, the enclosure smooth, polished, not striate, or at most only slightly striate laterally at base. ... Pseudoplisus, Ashm., n. g. (Type G. floridanus, Fox.)

Cubitus in hind wings interstitial or originating only a little before the transverse median nervure.

Cubitus in hind wings most frequently originating a little before the transverse median nervure; triangular area of metanotum always well defined, the enclosure always longitudinally striate Hoplisus, Lepel.

Cubitus in hind wings *interstitial;* triangular area of metanotum not sharply defined, but striate or coarsely rugose Hoplisoides, Gribodo.

3. Submedian cell longer than the median ; second cubital cell receiving both recurrent nervures ; anterior tarsi in ♀ with a comb ; triangular area of metathorax well defined, with some striæ at base..... Harpactus, Jurine.
= Dienoplus, Fox.

4. Second cubital cell not receiving both recurrent nervures ; hind tibiæ serrate 8.

Second cubital cell receiving both recurrent nervures, or rarely with the first recurrent interstitial with the first transverse cubitus ; hind tibiæ not serrate, although sometimes spinous.

Stigma not well developed, truncate at apex, the radius originating from its extreme apex..... 7.

Stigma well developed, not truncate at apex, the radius originating before its apex 5.

5. Anterior tarsi in ♀ *with* a comb.. 6.

Anterior tarsi in ♀ *without* a comb ; cubitus in hind wings originating far *beyond* the transverse median nervure.

First ventral segmemt *without* a carina or elevation, the second without an emargination at base, when viewed from the side, normal, not elevated..... Kaufmannia, Radoszk.

First ventral segment *with* a carina or elevation, the second abruptly truncate or with an emargination at base and elevated, so as to appear triangular when viewed from the side..... Gorytes, Latreille.

6. Transverse median nervure in front wings joining the median vein far *beyond* the origin of the basal nervure..... Lestiphorus, Lepel.

Transverse median nervure in front wings *interstitial* with the basal nervure.

Body marked with yellow; first abdominal segment above convex ; scutellum with a transverse impressed line at base, but the same not crenulate..... Clitemnestra, Spinola.

Body wholly black ; first abdominal segment with a hump-like elevation above ; scutellum *with* a transverse, crenulate furrow at base. (New Zealand)..... Argogorytes, Ashm., n. g.
(Type G. carbonarius, Smith.)

7. Submedian cell in front wings longer than the median ; antennæ filiform or subclavate ; pulvilli normal ; abdomen mostly rufous.

Cubitus in hind wings originating distinctly beyond the transverse median nervure Harpactus, Jurine.

Cubitus in hind wings *interstitial* with the transverse median nervure Agraptus, Wesmael.

8. First recurrent nervure *interstitial* or nearly, the second recurrent received by the second cubital cell near its apex; anterior tarsi in ♀ *without* a comb. Miscothyris, Smith.

SUBFAMILY II.—Alysoninæ.

This is a natural group, of small extent, and represented by only two genera, found in both hemispheres.

The species are somewhat narrowed and elongate, and superficially resemble the *Pseninæ*, in the family Pemphredonidæ, although structurally they are widely separated.

Our species have been monographed recently by Mr. Wm. J. Fox.

The genera may be distinguished as follows:

Table of Genera.

Submedian cell in front wings much longer than the median, the transverse median nervure joining the median vein far *beyond* the origin of the basal nervure; abdomen with a pale spot at each side of the second segment..... Didineis, Wesmael.

Submedian cell of front wings a little shorter than the median, the transverse median nervure joining the median vein a little *before* the basal nervure; abdomen without a pale spot on each side of the second segment..... .. Alyson, Jurine.

SUBFAMILY III.—Nyssoninæ.

This is also a natural and compact group, allied to the *Alysoninæ*, but markedly distinct in the more robust form and by the toothed metathoracic angles. In this last characteristic it shows some affinity with the Stizidæ, but otherwise—in mouth-parts, venation of wings, and in its thoracic characters—the subfamily is quite distinct and easily separated.

Our species in this group have been monographed recently by Mr. Wm. J. Fox, who, however, has suppressed all genera and placed all our species in the genus *Nysson*, Latr. Mr. Fox's work is excellent, but I do not believe in such wholesale lumping, and in the following table I have restored all of these genera, making use of such salient characters as I believe will render their recognition easy and certain.

Table of Genera.

Front wings with two cubital cells, the third transverse cubitus always wanting..... 5.

Front wings with three cubital cells, the second always petiolate; if with only two cubital cells, the second transverse cubitus wanting.

Two cubital cells, the first receiving both recurrent nervures.....3.
Three cubital cells.....2.

2. Second cubital cell receiving only one recurrent nervure.....4.
Second cubital cell receiving both recurrent nervures.

Cubitus in hind wings originating *before* the transverse median nervure or interstitial with it; hind tibiæ usually spinous, but not serrate on hind margin; scutellum normal; apex of abdomen in ♂ terminating in 2 teeth.....Nysson, Latreille.

Cubitus in hind wings originating beyond the transverse median nervure.

Hind tibiæ with feeble spines, never serrate; lateral margins of scutellum sometimes more or less margined, the postscutellum normal; apex of ♂ abdomen terminating in 2 teeth.....Brachystegus, Costa.

Hind tibiæ strongly *serrated* on hind margin, and also more or less spinous; lateral margins of scutellum more or less strongly reflexed, the postscutellum bilobed; apex of ♂ abdomen terminating in 4 teeth.....Paranysson, Guerin.

3. Cubitus in hind wings originating *beyond* the transverse median nervure, the latter short, straight, perpendicular; hind tibiæ on outer face armed with 4 teeth; pygidium very long, with the lateral margins denticulate.....Metanysson, Ashm., n. g.
(Type N. Solani, Ckll.)

4. Second cubital cell receiving only one recurrent nervure—*the second*, the first recurrent nervure received by the first cubital cell near its apex; posterior coxæ armed with a spine or tubercle at apex; abdomen normal.....Helioryctes, Smith.
(Type H. melanopyga, Smith.)

Second cubital cell receiving only one recurrent nervure—*the first*, the second recurrent nervure received by the third cubital cell far beyond the second transverse cubitus; posterior coxæ unarmed; hind tibiæ and scutellum as in *Nysson;* abdomen with ventral segments 4–6 each with a lateral tooth, apex of abdomen in ♂ 3-dentate.....Foxia, Ashm.

5. Second cubital cell triangular, but not petiolate, the first recurrent nervure received by the first cubital cell near its apex, the second recurrent interstitial; metathorax with the superior hind angles produced into strong stout spines.....Acanthostethus, Smith.

Second cubital cell petiolate, receiving both recurrent nervures; metathoracic teeth small, acute; scutellum normal; legs smooth, not spinous..... Hyponysson, Cresson.

SUBFAMILY IV.—Astatinæ.

Distinguished from all the other subfamilies by the truncate, appendiculate marginal cell in the front wings, and by the antennæ being inserted far anteriorly, close to the clypeal suture.

Fox has correctly pointed out the close relationship between his genus *Diploplectron* and *Dinetus*, Jurine, but both genera are too closely related to *Astatus* to warrant their separation as a distinct tribe.

Four genera fall into this group, separated as follows:

Table of Genera.

Marginal cell along the costa, much longer than the stigma; eyes in ♂ holoptic; front wings with three cubital cells..... 3.

Marginal cell, along the costa not longer than the stigma, most frequently shorter; eyes in ♂ normal, not holoptic.

Front wings with three cubital cells..... 2.

Front wings with two cubital cells.

Clypeus at apex in ♀ 3-dentate; tarsal comb distinct; all tibiæ spinous: antennæ in ♂ twisted, the scape much swollen, the flagellar joints 1–6 compressed; anterior tarsi flattened..... Dinetus, Jurine.

2. Clypeus medially convex, slightly produced anteriorly, without teeth; tarsal comb long, distinct; tibiæ spinous; antennæ filiform, similar in both sexes..... Diploplectron, Fox.

3. Second cubital cell not receiving both recurrent nervures, the first recurrent nervure *interstitial* with or received a little before the first transverse cubitus; marginal cell not quite twice as long as wide; eyes in ♂ *not* extending to base of mandibles; pronotum in ♀ strongly developed and not hidden beneath the anterior margin of the mesonotum; first cubital cell much longer than the second or third, nearly as large as both united..... Dryudella, Spinola.

Second cubital cell receiving both recurrent nervures; marginal cell at least twice as long as wide, and still longer in the ♂; eyes in ♂ extending to the base of mandibles; pronotum in both sexes deeply impressed beneath the anterior margin of the mesonotum; first cubital cell only slightly different from the second or third..... Astatus, Latreille.

North American Species.

Subfamily I.—*Gorytinæ.*

(1) Pseudoplisus, Ashmead.
- (1) P. abdominalis, Cr., ♀ ♂. = propinquus, Cr.
- (2) P. æqualis, Hdl., ♀ ♂.
- (3) P. alpestris, Cam., ♀ ♂.
- (4) P. alticola, Cam., ♀ ♂.
- (5) P. balteatus, Cam., ♀.
- (6) P. bipartitus, Hdl., ♀ ♂.
- (7) P. cameronis, Hdl., ♀ ♂.
- (8) P. centralis, Cam., ♀.
- (9) P. divisus, Smith, ♂.
- (10) P. fasciatus, Fox, ♀.
- (11) P. floridanus, Fox, ♀. = foveolatus, Fox.
- (12) P. fulvipennis, Smith.
- (13) P. fuscipennis, Cam., ♀
- (14) P. montanus, Cam., ♂.
- (15) P. notabilis, Hdl., ♀ ♂.
- (16) P. phaleratus, Say, ♀ ♂. = flavicornis, Pack. = modestus, Cr. = rufoluteus, Pack.
- (17) P. rubiginosus, Hdl., ♀ ♂.
- (18) P. Smithii, Cr., ♀.
- (19) P. splendidus, Hdl., ♀.
- (20) P. venustus, Cr., ♀ ♂.

(2) Hoplisus, Lepeletier.
- (1) H. albosignatus, Fox.
- (2) H. angustatus, Prov.
- (3) H. atricornis, Pack, ♂.
- (4) H. atrifrons, Fox, ♀ ♂.
- (5) H. canaliculatus, Pack.
- (6) H. cayenensis, Spin., ♀ ♂.
- (7) H. compactus, Fox.
- (8) H. decorus, Fox, ♀ ♂.
- (9) H. diversus, Fox, ♀.
- (10) H. fasciatipennis, Cam., ♀.
- (11) H. fuscus, Tischb., ♀ ♂.
- (12) H. geminus, Hdl., ♀ ♂.
- (13) H. maculipes, Cam.
- (14) H. nevadensis, Fox, ♀ ♂.
- (15) H. Provancheri, Hdl., ♂. = laticinctus, Prov.
- (16) H. ruficornis, Prov., ♀ ♂.
- (17) H. simillimus, Smith, ♀ ♂. = eppipiata, Prov.
- (18) H. vicinus, Hdl.

(3) Hoplisoides, Gribodo.
- (1) H. armatus, Prov.
- (2) H. asperatus, Fox.
- (3) H. bigeloviæ, Ckll.
- (4) H. barbatulus, Hdl., ♂.
- (5) H. confertus, Fox.
- (6) H. Coquilletti, Fox.
- (7) H. costalis, Cr.
- (8) H. dentatus, Fox.
- (9) H. denticulatus, Pack.
- (10) H. gracilis, Pattn.
- (11) H. hamatus, Hdl., ♂. = micantula.
- (12) H. laminiferus, Fox, ♂.
- (13) H. maculipennis, Cam.
- (14) H. mexicanus, Cam., ♀.
- (15) H. microcephalus, Hdl.
- (16) H. mirandas, Fox.
- (17) H. nebulosus, Pack.
- (18) H. Pergandii, Hdl.
- (19) H. placidus, Smith. = rufipes, Sm
- (20) H. punctifrons, Cam.
- (21) H. pygidialis, Fox, ♀.
- (22) H. robustus, Hdl., ♀.
- (23) H. rugosus, Pack.
- (24) H. seminiger, Dahlb.
- (25) H. scitulus, Cr.
- (26) H. sepulchralis, Hdl.
- (27) H. spilopterus, Hdl.
- (28) H. tricolor, Cress., ♀ ♂.

(4) Harpactus, Jurine. = Dienoplus, Fox.
- (1) H. Cockerellii, Ashm., ♀.
- (2) H. Howardii, Ashm, ♀.
- (3) H. insularis, Cr.
- (4) H. lateritius, Hdl., ♀ ♂.
- (5) H. mendicus, Hdl., ♀ ♂. = pictifrons, Fox.
- (6) H. tristrigatus, Fabr., ♀ ♂.

(7) H. (?) insolitus, Fox, ♂. (Gorytes.)
(5) Kaufmannia, Radoszk.
(6) Gorytes, Latreille.
(1) G. campestris, Liuné, ♀ ♂.
(2) G. costalis, Cr., ♀
(3) G. mystaceus, L., ♀ ♂.
(4) G. nigrifrons, Smith, ♀ ♂.
(5) G. (?) piceus, Hdl., ♂.
(6) G. (?) spilographus, Hdl.
(7) Lestiphorus, Lepel.
(8) Clitemnestra, Spinola.
(9) Argogorytes, Ashmead.
(10) Agraptus, Wesmael.
(11) Miscothyris, Smith.

Subfamily II.—*Alysoninæ.*

(12) Didineis, Wesmael.
(1) D. aculeata, Cr., ♂. (Alyson.)
(2) D. nodosa, Fox, ♂.
(3) D. peculiaris, Fox, ♀ ♂.
(4) D. solidescens, Scudd. (Fosil.)
(5) D. texana, Cr., ♀ ♂.
(13) Alyson, Jurine.
(1) A. conicus, Prov., ♂.
(2) A. Guignardii, Prov., ♀ ♂.
(3) A. melleus, Say, ♀ ♂.
(4) A. oppositus, Say, ♀ ♂.
(5) A. radiatus, Fox, ♀ ♂.
(6) A. striatus, Fox, ♂.
(7) A. triangularis, Fox.
(8) A. triangulifer, Prov., ♂.

Subfamily III.—*Nyssoninæ.*

(14) Nysson, Latreille.
(1) N. spinosus, Forst., ♀ ♂.
(2) N. plagiatus, Cr., ♀ ♂.
(3) N. Frey-Gessneri, Hdl., ♀ ♂.
(4) N. auronotatus, Say, ♀ ♂.
(5) N. aequalis, Pattn., ♀ ♂.
(6) N. compactus, Cr., ♀ ♂.
(7) N. subtilis, Fox, ♂.
(8) N. rusticus, Cr., ♀ ♂.
(9) N. simplicicornis, Fox, ♂.
(10) N. lateralis, Pack., ♂.
(11) N. tristis, Cr., ♂.
(12) N. fidelis, Cr., ♀ ♂.
(13) N. rufiventris, Cr., ♀ ♂.
(14) N. nigripes, Prov., ♂.
(15) N. quinquespinosus, Say, ♀ ♂.
(16) N. zapotecus, Cr., ♀.
(17) N. Aztecus, Cr., ♀.
(15) Brachystegus, Costa.
(1) B. opulentus, Gerst., ♀ ♂.
(2) B. mellipes, Cr., ♀ ♂.
(3) B. bellus, Cr., ♀.
(4) B. tuberculatus, Handl., ♀ ♂
(5) B. basilaris, Cr., ♀.
(6) B. pumilus, Cr., ♂.
(7) B. albomarginatus, Cr., ♀ ♂
(8) B. moestus, Cr., ♀.
(16) Paranysson, Guérin.
(1) P. texanus, Cr., ♀ ♂.
(2) P. fuscipes, Cr., ♀ ♂.
(3) P. mexicanus, Cr., ♀ ♂.
(4) P. dives, Handl., ♀ ♂.
(5) P. armatus, Cr., ♀ ♂.
(17) Metanysson, Ashmead.
(1) M. Solani, Ckll.
(18) Helioryctes, Smith.
(19) Foxia, Ashmead.
(1) F. pacifica, Ashm., ♀ ♂.
(20) Acanthostethus, Smith.
(21) Hyponysson, Cresson.
(1) H. bicolor, Cr., ♀.

Subfamily IV.—*Astatinæ.*

(20) Dinetus Jurine.
(21) Diploplectron, Fox.
(1) D. ferrugineus, Ashm., ♀.
(2) D. brunneipes, Cr., ♀ ♂.
(3) D. bidentatus, Ashm., ♀.
(4) D. Foxii, Ashm., ♀.
(22) Dryudella, Spinola.
(23) Astatus, Latreille.
(1) A. unicolor, Say, ♀ ♂.
(2) A. occidentalis, Cr., ♀ ♂.
(3) A. Leustromi, Ashm., ♀.
(4) A. nubeculus, Cr., ♀ ♂. = nigrospilosus, Cr.
(5) A. asper, Fox, ♀ ♂.
(6) A. bicolor, Say, ♀ ♂.
(7) A. pygidialis, Fox, ♀.
(8) A. nevadicus, Cr., ♀ ♂.

(9) A. montanus, Cr., ♀.
(10) A. elegans, Cr., ♀ ♂.
(11) A. bellus, Cr., ♂.
(12) A. coeruleus, Cr., ♂.
(13) A. albovillosus, Cam., ♀.
(14) A. Sayi, Fox, ♀.
(15) A. strigosa, Kohl, ♀.
(16) A. apicipennis, Cam.
(17) A. tinctipennis, Cam., ♀.
(18) A. Kohlii, Cam., ♀.
(19) A. picta, Kohl, ♂.
(20) A. mexicana, Cr., ♂.
(21) A. alpestris, Cam., ♀.
(22) A. insularis, Cr., ♀.

TABLES FOR THE DETERMINATION OF THE GENERA OF COCCIDÆ.

BY T. D. A. COCKERELL, N. M. AGR. EXP. STA.

(*Continued from page 279.*)

LECANIINÆ.

Secretion of ♀ more or less cottony.....Series I.
Secretion of ♀ waxy, glassy, or horny.....Series II.
Adult ♀ naked, or covered only by a film of secretion.....Series III.

Of course it must be understood that the expressions "glassy," "horny," and "cottony," refer only to the *appearance* of the secretion, not to its true nature.

SERIES I.

Female resembling a flat *Lecanium*, secreting an ovisac, which is elongated posteriorly, but does not at all cover the insect.....1.
Female surrounded by cottony secretion, but naked dorsally.....4.
Female completely or almost completely covered by a sac of cottony or felted secretion.....5.
Female secreting dorsally a thick mass of white waxy threads, which however do not cover the middle of the back; round the sides are threads spreading in all directions; antennæ six-jointed, 3 much the longest; legs rather slender; tibia longer than tarsus.....*Ceronema*, Mask.
Female oval or elliptical, with a loosely felted secretion, especially in the second stage, but absent or inconspicuous in the adult; antennæ 7-jointed: tarsus longer than tibia; margin with a fringe.....*Eriochiton*, Mask.

1. Female triangular, ovisac very slightly developed, a mere fringe round the hind margin.....*Protopulvinaria*, Ckll.
Female oval or suboval.....2.

2. Ovisac greatly elongating, free except at the end, lifting the insect into the air..... *Takahashia*, Ckll;

Ovisac continuously adherent to the twig or leaf.....3.

3. Body of ♀ more or less chitinous, becoming hard, and without dorsal patches of secretion..... *Pulvinaria*, Targ.*

Body of ♀ soft, not chitinous, pink in front, greenish on dorsum, with some black specks; back with patches of white secretion..... *Philephedra*, Ckll.

4. Antennæ 7-jointed; larva with strongly produced caudal tubercles; second stage with waxy secretion, somewhat as in *Orthezia*..... *Pseudopulvinaria*, Atkinson.

Antennæ 8 jointed; ovisac cone-shaped, fluted.... *Pulvinella*, Hempel.

5. Antennæ and legs quite rudimentary; skin not chitinous; thickly covered on dorsal surface with round glands; cottony secretion profuse..... *Pseudophilippia*, Ckll.

Antennæ and legs well-formed.....6.

6. Antennæ 8-jointed (sometimes 7 in *Spermococcus*).....7.

Antennæ 7-jointed; ♀ elliptical and convex, sac closely felted; skin with many large circular glands, and numbers of tubular glands; larva with strongly produced caudal lobes. [Possibly this may belong to the Coccinæ]... *Mallococcus*, Mask. (*Mallophora*, Mask.).

Antennæ 6-jointed.....8.

7. Body greatly elongated (like *Pergandiella*, etc.), with parallel sides; a considerable cephalic portion in front of the antennæ; legs ordinary, slender, and well developed..... *Signoretia*, Targ.

Body ovate; legs and antennæ slender; anterior tarsi two-jointed; antennæ 8-jointed; 8 the smallest. In ants' nests..... *Exæretopus*, Newstead, 1894.

Body about twice as long as broad; secreting at the last some cottony matter; antennæ 7 or 8-jointed, broad at the base; legs normal. In ants' nests. [Doubtfully distinct from *Lecanopsis*.]..... *Spermococcus*, Giard, 1893.

Body oval or suboval, like a *Pulvinaria*; ovisac produced posteriorly, often felted, usually leaving the cephalic end of the insect more or less exposed..... *Lichtensia*, Sign.

* *Tectopulvinaria*, Hempel, is an allied genus from Brazil, not yet published.

8. Elongated like *Signoretia*, but broader in the thoracic region; legs very short; antennæ short and stout, all the segments except 3 and 6 broader than long; sac cottony *Eriopeltis*, Sign.
Oval; legs and antennæ slender and ordinary; sides of the body and dorsum with numerous tubular glands; sac felted... *Filippia*, Targ.

SERIES II.

Male pupæ enclosed in a mass of spongy wax, which surrounds the wings *Ericerus*, Guèr.
Male pupæ separate 1.
1. Covering of ♀ horny in texture, formed partly of the pellicle of the second stage; antennæ in adult short, confusedly 7-jointed; legs absent; viviparous *Lecanochiton*, Maskell.
Not so 2.
2. Covering of ♀ consisting of wax, often thick; no marginal fringe or radiating processes; a more or less developed caudal horn, visible on removing the wax *Ceroplastes*, Gray.
Covering of ♀ consisting of wax, not thick, with seven long radiating processes arising from the margin, giving the insect a star-like appearance *Vinsonia*, Signoret.
Covering of ♀ waxy, not thick, with a marginal fringe of tooth-like processes, resembling more or less the teeth of a saw; antennæ and legs present *Ctenochiton*, Maskell.
Covering of ♀ glassy, or at least brittle, thin 3.
3. Legs and antennæ present in adult 4.
Legs and antennæ absent in adult 8.
4. Scale divided into plates, and striated with rows of air-cells *Inglisia*, Maskell.
Scale not striated with air-cells 5*.
5. Scale divided into two portions, each with small grooves radiating from its apex; antennæ 8-jointed *Parafairmairia*, nov. nom. (*Fairmairia*, Signoret, 1874: not of Desv., 1863.)
Scale not divided into two such portions 6.
6. Scale perfectly flat; glossy secretion in middle of back more or less broken up into small oval plates; genital aperture surrounded by cottony matter; antennæ 8-jointed; ♂ scale with dorsal area so narrow as to be practically a single ridge *Lagosinia*, n. g. (Type *Lagosinia Strachani*†.)

*Mr. Hempel, in describing *Edwallia*, does not say whether it has the air-cells or not.

†*Lecanium Strachani*, Ckll., Entm., 1898, p. 259.

Scale cone-shaped, with radiating ridges; antennæ 5-jointed..... *Edwallia*, Hempel.

Scale convex, but not cone-shaped; not divided at all, but rough or beset with protuberances; antennæ 7 or 8-jointed 7.

7. Natives of the arid region of N. America.....*Ceroplastodes*, Ckll. 1893.

Native of India..... *Ceroplastodes cajani* (Maskell).*

8. Quite flat, circular, with the glassy covering in two parts, divided longitudinally in the middle line; glassy covering with rows of air-cells as in *Inglisia*..... *Platinglisia*, Ckll., 1899.

Moderately convex, with the glassy covering in two parts, divided longitudinally, each part with a low eminence, from which lines radiate..... *Schizochlamidia*, Ckll., ined.

Very convex, with conical protuberances; glassy covering without rows of air-cells..... *Pseudokermes*, Ckll., 1895.

(To be continued.)

NEW GENERA AND SPECIES OF NYCTERIBIDÆ AND HIPPOBOSCIDÆ.

BY D. W. COQUILLETT, WASHINGTON, D. C.

Pterellipsis, n. gen.—Near Megistopoda, but with aborted wings. Head once and a half as high as long, in profile subhemispherical, covered with bristles which are longest on upper part of the front; eyes oval, situated on sides of head slightly behind the middle, no ocelli; antennæ one-jointed, flattened, elliptical, three-fourths as long as the head, once and a half as long as wide, covered with bristles and bearing a long one at apex. Thorax greatly compressed, strongly gibbous, the sternum flattened, its front end lamelliform and prolonged in front of the anterior coxæ, a longitudinal impressed median line and on each side, slightly behind its middle, is an impressed line extending from it obliquely outward and backward to the lateral margin just behind the middle coxæ; wings narrow, projecting obliquely upward and forward, divaricate, once and one-third as long as height of thorax, four times as long as wide, with three veins besides the costal, each of the median veins forked near the middle, the front fork of the anterior vein reaches the costa near the last fourth of its length, the posterior fork ends in the extreme tip of the wing; the forks of the following vein are united

**Eriochiton cajani*, Maskell, Ind., Mus. Notes, Vol. II., p. 61. I can only leave this in *Ceroplastodes* for the present, but I think the resemblance to that genus is probably due to convergence and not to real affinity.

at their apices, and extended obliquely forward, reaching the wing-margin slightly below the tip; a short distance before this union the anterior branch is connected by a crossvein with the posterior branch of the preceding vein; the other vein extends along the posterior margin of the wing nearly to its middle, then unites with the posterior fork of the preceding vein; veins bearing several stout bristles; halteres distinct; front femora considerably thickened, their tibiæ rather slender, middle femora rather robust, once and a third as long as the front ones, their tibiæ as thick as and nearly twice as long as the front ones, hind femora and tibiæ more slender than and nearly twice as long as the middle ones, each femur bearing several bristles, the tibiæ destitute of bristles; first four joints of the front and middle tarsi subequal in length, each slightly broader than long, together slightly longer than the fifth, which is considerably swollen; first joint of the hind tarsi twice as long as wide, as long as the two succeeding joints, the last joint swollen, as long as the three preceding ones; each tarsal claw bears a large lobe at the base of the under side. Abdomen elongate-ellipsoidal, broader and slightly longer than the thorax, bare except at each end and on the venter, where there are a few bristles. Type, the following species:

Pterellipsis aranea, n. sp.—Pale yellow, the abdomen opaque grayish black, knob of halteres white, tarsal claws and the lobe at their base black, bristles brownish yellow. Length 2 mm. Jamaica and Montserrat, W. I. Three specimens taken on bats in caves by the late Mr. H. G. Hubbard. Also 23 specimens collected on bats in Porto Rico by Mr. A. Busck. Type No. 4208, U. S. Nat. Museum.

Trichobius major, n. sp.—Reddish yellow, the abdomen largely grayish black, halteres white, tarsal claws black, the latter lobed at base of the under side; thorax scarcely longer than high; wings whitish yellow, veins yellow, first vein reaching the costa near last sixth of length of wing; abdomen of female bare except a cluster of bristly hairs on each side near the base and at the tip; in the male the hairs in these four clusters are much more numerous. Length 3 to 4.5 mm. Gum Cave, Citrus Co., Florida, and Chiricahua Mts., Ariz. Fifteen males and sixteen females, collected on bats by the late Mr. H. G. Hubbard. Type No. 4209, U. S. Nat. Museum.

Aspidoptera n. gen.—Near Trichobius, but the wings reduced to oblong, coriaceous organs appressed to the body and not reaching beyond the first fourth of the length of the abdomen, densely covered with rather long bristles. Head in profile subquadrate, but the upper margin longer than

the lower, vertical diameter only slightly shorter than the longitudinal, covered with stout bristles which are longest on the upper part of the head ; eyes narrow, situated near middle of sides of head, no ocelli ; antennæ inserted near lower part of the face, projecting obliquely forward and upward, nearly as long as the head, apparently one-jointed, greatly depressed, oval only slightly longer than broad, bristly and with a longer bristle at apex of each. Thorax polished, depressed, about twice as long as high, mesonotum covered with stout bristles, a median sulcus extending from the front end to the transverse sulcus, which is at the last fifth of the mesonotum. Wings inserted on the posterior end of the thorax, less than twice as long as broad; halteres normal. Legs short, femora greatly swollen, less than twice as long as thick, tibiæ flattened, as long as the femora but less than half as wide, first four joints of tarsi subequal in length, much wider than long, together as long as the fifth which is greatly swollen, claws lobed at base of under side. Type, the following species :

Aspidoptera Buscki n. sp.—Reddish yellow, the palpi and legs light yellow, tarsal claws black, halteres white, head with a subtriangular black spot each side of the middle of the upper side, abdomen opaque, tinged with gray, only slightly longer than broad, bristly on each side at the base and at the extreme apex, composed of two segments of which the basal one is less than one-fifth as long as the other. Femora bearing numerous bristles on the upper sides, the tibiæ with a rather long pubescence. Length 2 mm. A female specimen, found on a bat, *Artibeus* sp., in a cave at Bayamon, Porto Rico, Jan. 15, 1899, by Mr. A. Busck, after whom the species is named. Type No. 4210, U. S. Nat. Museum.

In Dr. Williston's recent manual the genus Ornithomyia is credited with tridentate tarsal claws, while in Olfersia they are said to be bidentate. As a matter of fact, the claws in these two genera are structurally identical, each having two blunt-pointed teeth near the base of the under side. Our Hippoboscid genera with fully developed wings separate as follows :

1. Anal cell closed by crossvein 2.
 Anal cell open to the wing-margin, ocelli wanting 4.
2. Humeral angles projecting forward in the form of long tubercles, antennæ greatly depressed, not situated in cavities, projecting at least nearly half the greatest diameter of the eyes in front of the latter ... 3.
 Humeral angles rounded or only slightly projecting, antennæ subovate, situated in cavities, projecting less than one-fourth greatest diameter of eyes in front of the latter (*Ornithomyia confluenta*, Say) *Anthoica*? Rond.

3. Ocelli present, scutellum smooth, bearing a row of bristles in front of the hind margin, the latter bare *Ornithomyia*, Latr.
 Ocelli wanting, hind margin of scutellum roughened with many nearly vertical ridges and fringed with bristles, scutellum otherwise bare. (Type: *Ornithomyia fulvifrons*, Walk.).. *Stilbometopa*, n. gen.
4. Anterior angles of thorax projecting forward in the form of long tubercles 5.
 Anterior angles of thorax rounded *Hippobosca*, Linn.
5. Clypeus one-half as long as the middle of the front, scutellum bearing a stout bristle near each lateral margin. *Olfersia*, Wied.
 Clypeus almost as long as the front, scutellum bare (Type: *P. maculata*, n. sp.) *Pseudolfersia*, n. gen.

Pseudolfersia maculata, n. gen. et sp. Front yellowish brown, the polished lateral margins and vertical triangle dark brown, the latter tapering anteriorly, broadly rounded at the tip, almost reaching the lower end of the front, a black bristle each side of the vertex and a row of smaller yellow ones on each side of the lower two-thirds of the front inside of the polished lateral margins; clypeus brown, yellowish medially, polished, noticeably longer than broad, notched in the middle of the apex and sulcate in the middle, the sulcus terminating in a deep fovea near the base of the clypeus; antennæ brown, subovate but flattened above, lying in deep grooves, not reaching apex of the clypeus, polished except the inner portion of its upper side which is opaque gray pruinose, bearing toward its apex a few yellow hairs and many long black bristles; palpi brown projecting slightly more than their greatest width beyond the apex of the clypeus; under side of the head brown, a yellow median longitudinal sulcus, and a rather large white lobe at its anterior end. Thorax dark brown, polished, the humeral tubercles apically yellow, a spot at inner side of each, another a short distance back of it, a stripe reaching from the prothoracic stigmata to base of wing, the transverse suture and a pair of spots on the posterior end of the thorax opaque gray pruinose, no median longitudinal sulcus, the transverse sulcus interrupted in the middle; pleura thinly gray pruinose except three spots along the suture in front of wings, sternum polished except its extreme anterior end which is gray pruinose; scutellum polished brown, truncate posteriorly, bare except a short pubescence along the posterior margin. Abdomen opaque grayish brown, the apex and venter yellow. Wings smoky brown, apex of auxiliary vein slightly beyond apex of second basal cell, that of first vein slightly beyond apex of first basal cell, of the second vein nearly midway between the apices of the first and third veins; first two sections of fourth vein subequal in length. Legs polished brown, front coxæ anteriorly opaque gray pruinose, pulvilli yellow, basal tooth of each tarsal claw yellowish. Length 7 to 8 mm. Wisconsin, on a Loon; also without indication of locality, on an Osprey, *Pandion haliactus carolinensis*. April 30, 1883. Nine specimens. Type No. 4211, U. S. Nat. Museum.

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THE WING STRUCTURE OF AN ARCHIPPUS BUTTERFLY.

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BUTTERFLY WING STRUCTURE.

BY J. ALSTON MOFFAT, LONDON, ONT.

Since the season of 1894 (when I first discovered that the upper and lower membranes of a butterfly's wing could be separated), I have had a desire to test the accuracy of the conclusions reached by me at that time; so with the remarkable profusion of *Anosia (Danais) Archippus*, Fab., in the season of 1899, I was able to secure such an abundance of material to work with that I could repeat the observations until every doubt was satisfactorily settled. I shall only give here a brief statement of results reached, as a full account of the various processes will be published in the forthcoming Annual Report of the Society for 1899.

When a wing is fully expanded, and for an hour or two after, the membranes can be easily separated. Entrance for a pin-point between them is to be found at the base of the wing where the subcostal and median nervures come close together. The membranes are united at the costal and inner edges, which have to be cut to get them apart; but they are free at the outer angle. At that time the nervures are in two parts, half in one membrane and half in the other, and open in the centre. The fluid which has been stored up in the pupa enters the winglet at the opening referred to, expanding the membranes as it passes along between them, and the nervures at the same time, and when it has extended to every portion of the wing, then it is fully expanded. The expanding fluid is of a gummy consistency, and as it dries, cements the membranes together, also the edges of the half-nervures, and produces the hollow tubes with which we are so familiar. The photograph for the plate was taken by Mr. R. W. Rennie, of this city, and is an admirable example of amateur photography.

DESCRIPTION OF PLATE 6.

Fig. 1 shows the inner sides of upper and lower membranes of a front and hind wing.

Fig. 2 is the inner side of an under membrane of a front wing.
" 3 is the inner side of an upper membrane of a male hind wing, disclosing the inner side of the black sexual spot.
" 4 is the inner side of an upper membrane of a front wing.
" 5 is the inner side of the lower membrane of a female hind wing.
" 6 shows inner sides of both membranes of a winglet, united at the base. Its exact length is five-eighths of an inch.
" 7 gives a view of a perfect front winglet. The opposite one is incomplete.
" 8 is the under surface of a hind winglet. The opposite one is the upper surface of another. Both imperfect.
" 9–10 are the wings of one butterfly. Length, from base to apex, two inches; width at outer angle, one inch and a quarter.

The membranes at Fig. 1 were separated under water, and the gummy fluid on their inner sides washed off clean. Those at Figs. 2, 3, 4 and 5 were separated without the use of water, the expanding fluid being allowed to dry on, producing the appearance of a thin coat of varnish spread over the whole inner sides of the membranes.

ON THE CLASSIFICATION OF BEES.

BY CHARLES ROBERTSON, CARLINVILLE, ILLINOIS.

During the last winter, in connection with the study of the local bees, I had occasion to write out my views in regard to their classification, basing my observations upon the recent Apidæ catalogue of Della Torre. As the views then arrived at form a fair statement of my present opinions, I venture to offer them in connection with the recent paper of Mr. Ashmead on the classification of the bees.*

In the arrangement of these insects I attach the most importance to the venation, since it is hardly subject to modifications connected with changes of habit, and shows the least tendency to variation. In the lower bees the first submarginal cell is about as long as the second and third together, and its shortening may be regarded as a specialization. In the more highly specialized venation the marginal cell is truncate or has its apex more remote from the border of the wing. In a similar way a small stigma may be regarded as a characteristic of the more highly

*Trans. Am. Ent. Soc., XXIV, 49-100, 1899.

specialized venation. The most plastic characteristic of the venation is the reduction of the submarginal cells from three to two. This occurs by the obliteration of the first or second transverse cubitals or their coalescence.

I have examples of the following bees in which the first transverse cubitus is wanting: *Sphecodes confertus (falcifer)*, 4 spec., both wings; *S. mandibularis*, 2 spec., both wings; *S. antennariæ*, 2 spec., both wings, 1 spec. one wing; *Augochlora confusa*, 1 spec. one wing; *Andrena claytoniæ*, 1 spec., one wing; *Nomada Cressonii*, 1 spec., both wings; *N. obliterata*, 15 spec., both wings, 6 spec. one wing. Examples of the following species have the second transverse cubitus wanting: *Sphecodes antennariæ*, 1 spec., one wing; *Augochlora confusa*, 1 spec., one wing; *Andrena platyparia*, 1 spec., both wings; *A. solidaginis*, 1 spec., one wing; *A. bipunctata*, 1 spec., one wing; *A. Forbesii*, 1 spec., one wing; *A. claytoniæ*, 3 spec., both wings, 1 spec. one wing; *Nomada Sayi*, 1 spec., one wing. Of the nine specimens of *Sphecodes*, all have the first transverse cubitus wanting, one of these having the second obliterated in the other wing. Of the eight specimens of *Andrena*, all have the second transverse cubitus wanting, one of these having the first obliterated in the other wing. Of twenty-two specimens of *Nomada obliterata*, only one has three submarginal cells in both wings. *Halictus anomalus* and *H. lustrans* (*Hemihalictus lustrans*, Ckll., = *Dufourea lustrans*, Ashm.) I regard as anomalous species of *Halictus* in which the second transverse cubitus is wanting.

As far as I know there is no bee with three submarginal cells in which the first recurrent nervure enters the first submarginal cell, or is interstitial with the first transverse cubitus. When the first submarginal is long, the second quite short, and the first recurrent nervure enters the first, or is interstitial, the first submarginal cell is composite, the next is the third, and the dividing nervure is the second transverse cubitus. I consider that the first transverse cubitus is regularly wanting in *Prosopis*, *Panurginus* and *Neopasites*.

When the submarginal cells are of nearly equal length, and the second receives both recurrent nervures (the first recurrent being rarely interstitial, or nearly so), the first cell is normal, the next is composite, and the dividing nervure is the first transverse cubitus. The second transverse cubitus is regularly wanting in *Parandrena*, *Biareolina*,

Halictoidinæ, *Macropis*, *Panurginæ* except *Panurginus*, *Megachilinæ*, *Eucera*, *Ammobates*, *Pasites*, *Biastes*.

In Perditinæ the long submarginal cell is the first, the next is the third, and the dividing nervure is formed by the coalescence of the first and second transverse cubitals.

These three types of venation are no evidence of affinity, but must have had an independent origin from wings with three submarginal cells.

Characters connected with nectar-sucking, pollen-collecting, and the inquiline habit are, as compared with the venation, more physiological. They no doubt usually indicate relationship, but they often obscure it. I think they may be relied upon when they are confirmed by the venation. On the other hand, when the venation indicates relationship it is hard to disprove it by evidence drawn from the tongue, pollen scopæ, and characters connected with the inquiline habit. If the venation is of a low type, such as that of *Andrena* or *Halictus*, I think the genus should be assigned to a low position in spite of the tongue and scopæ. Usually specializations of venation, tongue and scopæ go hand in hand, but often they do not. A slightly specialized tongue may go with a highly specialized scopa, as in *Macropis*. Or a slightly specialized scopa may go with a highly specialized tongue, as in *Ceratina*. In such cases I assign the bee to a low or high position according to the character which seems to be supported by the venation.

To my mind the most egregious errors in the classification of bees seem to be in the location of the inquilines. The analogy of the case of *Bombus* and *Psithyrus* seems to me of prime importance in the solution of the question. No one doubts that they are more closely related to each other than either is to any host bee or any inquiline. The only differences *Psithyrus* shows are such as are correlated with the inquiline habit. Della Torre's last subfamilies of bees are : 12 Bombinæ ; 13 Psithyrinæ, 14 Apinæ. To give *Psithyrus* this rank, I think, involves a great systematic error only equalled in the old physiological classification of Shuckard. The latter author calls those bees which carry pollen on their legs scopulipedes ; those with abdominal brushes, dasygasters. Under Nudipedes he includes all British bees without scopæ, except *Prosopis*, *Sphecodes*, and *Psithyrus*. But *Coelioxys* and *Stelis* are developed from nudigasters and are related to the Megachilinæ. Della

Torre's subfamily 11 is Coelioxynæ, including *Coelioxys*, which I regard as a nudigaster, and *Anomobates*, which I regard as a nudipede.

From the analogy of *Bombus* and *Psithyrus*, I claim that *Coelioxys* is related to *Megachile*, *Stelis* to *Anthidium*, *Melecta* to *Anthophora*, *Nomada* to *Andrena*: not only, however, on this analogy, but also on morphological grounds, from the venation and other characters.

Assuming that the inquilines arose from some of their hosts, as is certain in the case of *Bombus* and *Psithyrus*, we would expect the most resemblance between host and inquiline in the recent cases of the highly specialized bees, as *Bombus* and *Psithyrus*, and the least in the oldest cases of the least specialized bees, as *Andrena* and *Nomada*.

In Della Torre's classification, as above stated, *Psithyrus* follows *Bombus*, though in different subfamilies. I would give *Psithyrus* the same position, but put both in the same subfamily. *Stelis* follows *Anthidium* in a separate subfamily, whence I would remove it to follow *Megachile* in Megachilinæ. Also *Melecta* and *Epeolus* follow *Anthophora*, but in a separate family. I would separate *Anthophora* from *Mellissodes*, etc., and put *Melecta* and *Epeolus* with it.

Nomada must seem the most far-fetched of my cases. Although it has a long first discoidal cell, I think other characters of the venation separate it far from *Melecta* and *Epeolus*, especially the large stigma and pointed marginal cell. I think *Nomada* is an ancient offshoot from *Andrena*, and is not related to any other genus. Its differences from *Andrena* and resemblances to other bees I hold are acquired, not inherited. After *Andrena* I would place *Parandrena*, a more recent offshoot, and then write *Nomada*.

In this connection I think the taxonomic proposition will hold that an offshoot from a certain group is related to that group. It may acquire resemblances to the other forms, but not relationship.

That Mr. Ashmead is right in interpolating the inquiline bees among the host bees is no doubt correct, but this has been done by Della Torre to such an extent as to destroy the contrast which exists between Mr. Ashmead's arrangement and the old-fashioned and unnatural arrangement of Schmiedeknecht. As in the Della Torre arrangement, I hold that Mr. Ashmead does not go far enough; indeed, it seems to me that he refutes his own scheme by the very arguments which he cites in defence of it In his section III. Schmiedeknecht arranges certain bees whose differences

from other bees and resemblances among themselves are associated with the inquiline habit, ignoring the characters which indicate their true relationship. Mr. Ashmead's arrangement of those bees seems to me to illustrate the same kind of taxonomy. If, according to Mr. Ashmead, the inquilines can not form a natural group of Apidæ parasiticæ on account of their varied relationships to other bees, how can *Coelioxys*, which he admits is derived from *Megachile*, and *Stelis*, which he admits is derived from *Anthidium*, form a natural family of *Stelidæ*? In the same line is the reference of all of the inquilines to separate families. Even *Psithyrus* is referred to a special family and separated from the Bombidæ by the interpolation of another family.

Mr. Ashmead's remarks regarding *Macropis* and the Panurgidæ have no significance, in view of the fact that he admits that Panurgidæ is not a natural group; but how can recent offshoots from *Andrena* and *Halictus* and offshoots from Anthophidæ form a natural family? What is to keep a recent offshoot from *Andrena* from being related to *Andrena*? The two submarginal cells can, as I have observed above, be shown to be of three types, all of which must have had an independent origin from bees with three submarginal cells.

The resemblance between the tongues of *Colletes* and *Prosopis* seems to me to be uninherited and misleading. I would follow Schmiedeknecht in arranging *Colletes*.

The arrangement of the inquiline bees with the host-bees will make it a little more difficult to define the groups, and will give some trouble to amateurs who lack an elementary knowledge of morphology. But it will bring us down to the consideration of the characters which are the most important clues to relationship.

I shall now offer what seems to me the most natural arrangement of the local bees:

(1) *Andreninæ:* Andrena, Parandrena, Nomada, Colletes, Nomia.
(2) *Prosopidinæ:* Prosopis.
(3) *Halictinæ:* Sphecodes, Halictus, Augochlora, Agapostemon.
(4) *Halictoidinæ:* Halictoides.
(5) *Melittinæ:* Macropis.
(6) *Panurginæ:* Pseudopanurgus, Calliopsis.
(7) *Perditinæ:* Perdita.

(8) *Megachilinæ:* Andronicus, Alcidamea, Osmia, Heriades, Megachile, Coelioxys, Anthidium, Stelis.

(9) *Ceratininæ:* Ceratina.

(10) *Melissodinæ:* Synhalonia, Xenoglossa, Melissodes, Entechnia, Emphor.

(11) *Xylocopinæ:* Xylocopa.

(12) *Anthophorinæ:* Anthophora, Clisodon, Habropoda, Bombomelecta, Melecta, Epeolus, Neopasites.

(13) *Bombinæ:* Bombus, Psithyrus.

(14) *Apinæ:* Apis.

It seems to me that Mr. Ashmead's classification is an improvement on that of Della Torre: in placing *Sphecodes* near *Halictus*; in separating *Colletes* from *Prosopis*, as far as he goes; in giving a lower position to Megachilidæ, which the long first submarginal cell clearly supports, and in separating *Ceratina* from *Xylocopa*.

In placing *Colletes* with Andreninæ I mean to emphasize the importance of the venation, facial foveæ and pollen-apparatus against the form of the tongue.

At present I do not accept *Pseudopanurgus* as a synonym of *Panurginus*. I refer to it *Scrapter andrenoides* Sm., *Calliopsis albitarsis* Cr., *asteris*, *labrosus*, *rudbeckiæ*, *parvus*, *compositarum*, *solidaginis*, *rugosus*, and *Panurginus labrosiformis*.

The genera Mr. Ashmead refers to Panurgidæ, I would arrange in the following way, excepting those of which I have not seen examples: —*Andreninæ:* Andrena (= Biareolina, Parandrena); *Halictinæ:* Halictus (incl. Dufourea Ashm., Hemihalictus Ckll.); *Halictoidinæ:* Dufourea, Halictoides, Rhophitoides, Rhophites; *Melittinæ:* Macropis; *Dasypodinæ:* Dasypoda; *Panurginæ:* Panurgus, Panurginus (= Scrapteroides), Pseudopanurgus, Epimethea, Camptopocum, Calliopsis; *Perditinæ:* Perdita, etc.

CORRIGENDA.

Page 8, first line of description of Psilopa petrolei, erase the comma after the word "coloured."

Page 100, lines 15 and 9 from bottom; page 111, line 6 from top; and page 112, lines 4 and 19 from top: for Lasius Americanus, *Gm.*, read *Em.*

Page 112, line 12 from bottom, for "Australia *to* Japan," read "Australia *and* Japan."

Page 335, last line, for "*Anthoica?*" read "*Ornithoica.*"

ERRATUM—Page 332, line 8 from top, for "wings" read "twigs."

NOTES ON PHILANTHUS.

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In the CANADIAN ENTOMOLOGIST, 1899, p. 293, ff., Mr. Ashmead has divided, first *Aphilanthops* into *Clypeadon*, Patton, and *Aphilanthops*, Patton, and secondly *Philanthus* into *Epiphilanthus*, *Pseudanthophilus*, *Anthophilus*, and *Philanthus*.

(i.)

Mr. Patton describes *Clypeadon* in *Entomological News*, 1897, p. 13, as separated from *Aphilanthops* by its "dorsal valve subquadrate, ventral valve bilobate." *A. quadrinotatus*, Ash., ♀, presents both these characters; *A. elsiæ*, Dunn, ♀, the latter, the other forms not at all. The other characters given by Mr. Ashmead are not sufficient to make a new genus. I am therefore forced to conclude that *Clypeadon* is not valid.

(ii.)

Under (4), page 294, above cited, Mr. Ashmead divides *Philanthus* into *Philanthus* (6) and three new genera (5). While the difference in the eye-emargination exists, it is not true of the division here made. Neither does the division on the venation of the hind wing hold. The one character left is in the punctuation of the abdomen. This is an insufficient foundation for new genera.

(iii.)

A consideration of the characters given under (5), page 294, and based on *Phil. solivagus* ♂ ♀, *P. ventilabris* ♂ ♀, and *P. politus* ♀, gives me the following result:

(i.) There is no difference whatsoever, in so far as I can detect, between the relative lengths of median and submedian cells on the externo-medial nervure.

(ii.) The distance on the cubital nervure, between the junction of the 2nd transverso-cubital nervure and the 2nd recurrent nervure, is less in *solivagus* than in *ventilabris* or *politus*, but that does not change the relative lengths of 2nd and 3rd submarginal (or cubital) cells on the 2nd transverso-cubital nervure (which I take "radius" to mean).

(iii.) While the abdominal segments (excepting the 1st) are less constricted in *solivagus* than in *ventilabris* or *politus*, nevertheless the constriction is there.

As regards the *Pseudanthophilus* and *Anthophilus*, I find clypeus margined in both species cited as types, that the junction of 1st recurrent nervure varies in both species anywhere from the middle to the quarter of the second submarginal cell, and that the one character separating them lies in the last joint of the ♂ antennæ. These cannot, therefore, be considered valid genera.

CLASSIFICATION OF THE ENTOMOPHILOUS WASPS, OR THE SUPERFAMILY SPHEGOIDEA.

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(Paper No. 7.—Conclusion.)

FAMILY XXIV.—Stizidæ.

This family has been associated usually, as a tribe, with the family *Bembicidæ*, with which, however, according to my views, it has no relationship whatever. It is in reality much closer allied to the *Nyssonidæ*, next to which I have placed it, and from which some of the species are separated with difficulty.

The characters made use of in my table of families will, however, I think, readily separate these three families, and it is unnecessary to repeat them here.

Gorytes moneduloides, Packard, belongs to this family and not to the *Nyssonidæ*, and, as well as I can make out from the description, represents Costa's genus *Ammatomus*. Its entire habitus—the large eyes, the free, almost semicircular labrum, etc.—is that of a Stizid and not of a Nyssonid, and I feel satisfied it belongs here, although, not having seen an authentic specimen of *Ammatomus*, Costa, I may be wrong in assigning it to that genus.

Exeirus, Shuckard, and *Kohlia*, Handlirsch, are included in this family from the descriptions and figures alone, since both are unknown to me in nature.

The genera *Stizoides*, Guerin, and *Megastizus*, Patton, were suppressed by Handlirsch and Kohl, and included with *Stizus*, Latreille. Fox has followed them in this, but, according to my views, all these are good and distinct genera, and I have here restored *Stizoides* and *Megastizus* to their original standing.

It is believed that the following table will enable the student to recognize all of these genera without any difficulty:

Table of Genera.

Marginal cell much shorter than the first cubital cell, rounded at apex; pygidial area in ♀ wanting or incompletely defined; abdomen in ♂ ending in 3 spines.....4.

Marginal cell as long or much longer than the first cubital cell.

Second cubital cell *not* petiolate, receiving both recurrent nervures. 2.
Second cubital cell petiolate, oblong, in outline almost elliptical, and receiving both recurrent nervures; cubitus in hind wings originating a little beyond the transverse median nervure or almost interstitial Exeirus, Shuckard.

2. Marginal cell lanceolate, *without* an appendage; submedian cell longer than the median 3.
Marginal cell at apex slightly rounded, *with* an appendage; submedian cell a little shorter than the median.
First transverse cubitus broken by a stump of a vein a little before the middle; hind wings with the cubitus originating much before the transverse median nervure. Kohlia, Handlirsch.

3. Marginal cell almost twice as long as the first cubital cell, or at least one and a half times as long; pygidial area in ♀ distinct, triangular; anterior tarsal joints 2–4 short, transverse.
Cubitus in hind wings originating from about the apical third of the submedian cell; second cubital cell, along the cubitus, fully four times or more longer than along the radius; antennæ longer than the head and thorax united, subclavate; abdomen in ♂ ending in a single spine. Species large. . Sphecius, Dahlbom.
Cubitus in hind wings originating from the apical sixth of the submedian cell; second cubital cell, along the cubitus, scarcely three times as long as along the radius; antennae shorter than the head and thorax united, strongly clavate; abdomen in ♂ ending in two short teeth Ammatomus, Costa.
Marginal cell not much longer than the first cubital cell; cubitus in hind wings originating a little before the transverse median nervure, or almost interstitial; abdomen in ♂ unarmed (♀ unknown) Handlirschia, Kohl.

4. Cubitus in hind wings originating far *before* the transverse median nervure, or never beyond the apical third of the submedian cell; mandibles simple; intermediate tarsi longer than their tibiæ, the joints 3–4 short, lobed; claws long, the pulvilli moderate Stizoides, Guerin.
Cubitus in hind wings originating at about the apical fifth of the submedian cell; mandibles dentate or simple.

Anterior and intermediate tarsi short, not longer than their tibiæ, the joints 2–4 very short, wider than long, and lobed ; the pulvilli very large ; posterior face of metathorax not deeply impressed, the lateral angles not sharp, rounded and without a deep emargination ; last joint of antennæ in ♂ slightly bent, truncate at apex, the antepenultimate and penultimate joints normal.....Megastizus, Patton.

Anterior and intermediate tarsi always distinctly longer than their tibiæ, the joints 2–4 short, but, except sometimes the fourth, not lobed ; posterior face of metathorax deeply impressed, the lateral angles or ridges sharp, and with a deep emargination ; second cubital cell triangular, always narrowed to a point or nearly above, and often petiolate ; last two joints of antennæ in ♂ curved, the last pointed or ending in a slight spine, the antepenultimate joint *beneath at apex*, ending in a small spine.....Stizus, Latreille.

= Bembecinus, Costa.

= Stizomorpha, Costa.

North American Species.

(1) Exeirus, Shuckard.

(2) Kohlia, Handlirsch.

(3) Sphecius, Dahlbom.

(1) S. speciosus, Drury, ♀ ♂.

(2) S. corvallis, Patt., ♀ ♂.

(3) S. Hogardii, Latr., ♀ ♂.

(4) S. grandis, Say, ♀ ♂.

(5) S. fervidus, Cr., ♀ ♂.

(6) S. nevadensis, Cr., ♀.

(7) S. raptor, Handl.

(4) Ammatomus, Costa.

(1) A. moneduloides, Pack. (Gorytes) ♀ ♂.

(5) Handlirschia, Kohl.

(6) Stizoides, Guerin.

(1) S. unicincta, Say, ♀ ♂.

(7) Megastizus, Patton.

(1) M. brevipennis, Walsh, ♀ ♂

(2) M. texanus, Cr., ♀ ♂.

(8) Stizus, Latreille.

(1) S. Godmani, Cam.

(2) S. nanus, Handl.

(3) S. flavus, Cam.

var. subalpinus, Ckll.

(4) S. Servillei, Lepel.

(5) S. xanthochrous, Handl.

(6) S. moneduloides, Cr., ♀ ♂.

(7) S. neglectus, Smith, ♂.

(8) S. lineatus, Cr., ♂.

Family XXV.—Sphegidæ.

This family is readily distinguished from all of the previously

described families in the Sphegoidea, by having the abdomen distinctly petiolated, and the totally different habitus.

In having a petiolate abdomen it agrees with the family *Ampulicidæ*, but otherwise it is quite distinct, and is readily separated from it by the normally shaped mesosternum, which is never produced posteriorly into a forked process, and by the clypeus not being produced posteriorly between the antennæ, the latter being always inserted *above* the base of the clypeus.

The family, as here restricted, may be separated into four natural groups, which I have designated as subfamilies, and which may be recognized by the use of the following table:

Table of Subfamilies.

Second cubital cell receiving both recurrent nervures, or the second recurrent nervure is interstitial *with* the second transverse cubitus, although sometimes the first recurrent is interstitial with the first transverse cubitus, or then received by the first cubital cell; tibiæ either spinous or entirely smooth without spines.....2.

Second cubital cell receiving only one recurrent nervure—the first; second recurrent nervure received by the third cubital cell, or at least beyond the second transverse cubitus; very rarely are both recurrent nervures received by the first cubital cell (Neosphex, Reed, = Pseudosphex, Tischb.).

Antennæ inserted on the middle of the face; claws with 1 to 5 teeth beneath; tibiæ *strongly spinous*, or at least never with weak or feeble spines; tarsal comb in ♀ always present; cubitus in hind wings most frequently interstitial, or nearly, with the transverse median nervure; head transverse.....Subfamily I., Spheginæ.

Antennæ inserted far anterior to the middle of the face; claws simple, *without* teeth, or at most with a single small tooth near the middle; tibiæ *smooth*, not spinous; tarsal comb in ♀ *never* present; cubitus in hind wings interstitial..Subfamily IV., Podiinæ.

2. Claws simple, *without* a tooth beneath; tibiæ more or less spinous; tarsal comb in ♀ present; abdomen most frequently very elongate, the petiole composed of *2 joints*, rarely with only *1 joint*; cubitus in hind wings usually originating *beyond* the transverse median nervure.....Subfamily II., Ammophilinæ.

Claws with a single tooth beneath, although sometimes very minute, more rarely without a tooth, the claws simple; tarsal comb in ♀ wanting; abdomen always with a 1-jointed petiole; cubitus in hind wings interstitial.

Antennæ inserted on the middle of the face; metathorax *with* a large U-shaped area above; mesopleura not longer than the height of the thorax.....Subfamily III., Sceliphroninæ.

Antennæ inserted far anterior to the middle of the face, *on* or just above an imaginary line drawn from base of eyes; metathorax *without* a large U-shaped area above; mesopleura much longer than the height of the thorax.....Subfamily IV., Podiinæ.

SUBFAMILYY I.—Spheginæ.

In this group, or subfamily, the second and third cubital cells, in the front wings, each receive a recurrent nervure, or both recurrent nervures are received by the first cubital cell; the antennae are inserted on the middle of the face; the tibiæ are strongly spinous; the anterior tarsi in the ♀ always provided with a tarsal comb; while the claws are never simple, being always armed with from 1 to 5 teeth.

Some of the genera falling in this group are quite closely allied and difficult to separate, but it is believed all can be easily separated with the use of the following table:

Table of Genera.

Front wings with three cubital cells, the second and third each receiving a recurrent nervure.....2.

Front wings with only two cubital cells, the first receiving both recurrent nervures; marginal cell short, rounded at apex; median and submedian cells equal; cubitus in hind wings originating *beyond* the transverse median nervure; claws with 2 blunt teeth beneath.....Neosphex, Reed.
= Pseudosphex, Tischb.

2. Second cubital cell wider (higher) than long.....4.
Second cubital cell as long or longer than wide (high), rhomboidal or rectangular.....3.

3. Head normal, transverse, pronotum shorter than the mesonotum or no longer; claws with 2 teeth beneath.

Clypeus anteriorly truncate, usually with a reflexed rim and without a median emargination (rarely dentate); scutellum and

postscutellum most frequently *with* a median longitudinal furrow or depression, or at least one or the other with such a furrow, rarely simple.....Sphex, Linne.

Clypeus anteriorly *with* a median emargination or incision; scutellum and postscutellum normal, *without* a median longitudinal furrow.....Isodontia, Patton.

4. Claws with only one tooth beneath.....5.
Claws with 2–5 teeth beneath.....6.

5. Species metallic blue or violaceous; marginal cell at apex narrowly rounded; cubitus in hind wings *interstitial* with the transverse median nervure; mandibles not especially long; tibiæ more sparsely and feebly spined; maxillary palpi 6-jointed; labial palpi 4-jointed.....Chlorion, Latreille.

Species, except sometimes the abdomen, not metallic; marginal cell at apex truncate or broadly rounded; cubitus in hind wings originating *beyond* the transverse median nervure; mandibles unusually long; tibiæ in ♀ strongly spined; maxillary palpi 6-jointed; labial palpi 5-jointed.....Pronaeus, Latreille.

6. Last ventral plate in ♀ compressed, almost carinate; claws with 2 teeth.....7.
Last ventral plate in ♀ convex, not compressed; claws with 2–5 teeth beneath.....8.

7. Clypeus medially produced, with a deep sinus on each side.....Palmodes, Kohl.
Clypeus obtrapezoidal, truncate anteriorly, entire; eyes within parallel.....Calosphex, Kohl.

8. Claws with 2 teeth; clypeus convex, anteriorly subemarginate medially, without a reflexed rim; anterior tarsal comb short; transverse median nervure in hind wings short..Harpactopus, Smith.
Claws with 3 to 5 teeth; clypeus subconvex, with a more or less distinct reflexed rim anteriorly; anterior tarsal comb long.

Claws with 3–4 teeth; clypeus anteriorly slightly rounded, and not at all, or only slightly, emarginate; transverse median nervure in hind wings curved or somewhat curved, the cubitus *interstitial*, or nearly, with it.....Parasphex, Smith.

Claws with 4–5 teeth; clypeus anteriorly truncate, with a median emargination; cubitus in hind wings originating *beyond* the

transverse median nervure, the latter being straight; mandibles in ♀ 3-dentate, in ♂ 2-dentate.....Prionony x, Dahlb.

SUBFAMILY II.—Ammophilinæ.

The species falling in this group are much more slender and elongate than those of the other groups, and are at once distinguished by the *simple, unarmed* claws, and by the venation of the wings; the second cubital cell in the front wings always receives both recurrent nervures, while the cubitus in the hind wings originates *beyond* the transverse median nervure. The tarsal comb in the ♀ is always present.

Two other subfamilies—*Sceliphroninæ* and *Podiinæ*—have both recurrent nervures received by the second cubital cell; but in these families the claws are armed with a tooth beneath, the tarsal comb in the ♀ is always wanting, while the cubitus in the hind wings is interstitial with the transverse median vein.

Only four genera fall into this family, distinguished as follows:

Table of Genera.

Front wings with two cubital cells.....2.

Front wings with three cubital cells: submedian cell a little shorter than the median.

Petiole of abdomen not especially long, 1-jointed, the second segment campanulate; clypeus in ♀ with a more or less distinct median emargination.....Psammophila, Dahlb.

Petiole of abdomen very long, 2-jointed, the second segment being elongate and slender, forming with the first a long petiole.

Third cubital cell not petiolate.....Ammophila, Kirby.

Third cubital cell petiolate.....Miscus, Jurine.

2. Petiole long, 2-jointed, as in *Ammophila;* submedian cell as long as the median.....Caloptera, Fabricius.

SUBFAMILY III.—Sceliphroninæ.

In having both recurrent nervures received by the second cubital cell, this subfamily approaches the *Ammophilinæ*, but it is readily separated from it by the claws having, as a rule, a single tooth beneath; by the cubitus in the hind wings being interstitial with the transverse median nervure, and by the ♀ always being without a tarsal comb.

From the *Podiinæ* it is separated by the antennæ being inserted on the middle of the face, by the large U-shaped area on the metathorax or middle segment, and by the much shorter mesopleura.

Only two genera are known, distinguished as follows:

Table of Genera.

Second submarginal cell receiving both recurrent nervures.

Species black and yellow, not metallic; clypeus flat, at apex *bidentate;* transverse median nervure in front wings *not* interstitial with the basal nervure, but uniting with the median vein a little *before* the origin of the basal nervure; petiole of abdomen about twice as long as the metathorax.....Sceliphron, Klug.
= Pelopœus, Latr.

Species metallic blue or violaceous; clypeus anteriorly *3-dentate*; transverse median nervure in front wings *interstitial* with the basal nervure; petiole of abdomen not or scarcely longer than the metathorax.....Chalybion, Dahlb.

Subfamily IV.—Podiinæ.

This subfamily comes nearest to the *Sceliphroninæ*, but is at once separated by the antennæ being inserted on the anterior part of the face, *on* or *just above* an imaginary line drawn from the base of the eyes; by the much longer mesopleura, and by the absence of a large U-shaped area on the metathorax or middle segment.

Three genera are known, separated as follows:

Table of Genera.

First and second cubital cells each receiving a recurrent nervure, or the *first* recurrent is interstitial with the *first* transverse cubitus.....2.

Second and third cubital cells each receiving a recurrent nervure, or the *second* recurrent is interstitial with the *second* transverse cubitus.....3.

Second cubital cell receiving both recurrent nervures..Podium, Fabricius.

2. Second cubital cell wider than long; hind femora, in both sexes, normal, the basal joint of their tarsi much shorter than their tibiæ; petiole long or longer than the metathorax...Podium, Fabr. (pars.)
Second cubital cell longer than wide; hind femora in ♀ dilated at apex, their tibiæ shortened, the basal joint of their tarsi as long, or nearly, as the tibiæ; petiole shorter than the metathorax. Stethrorectus, Smith.

3. Head in outline as seen from above, triangular, much produced behind, the temples oblique, but broad; pronotum conically produced, longer than the meso- and meta-notum...Trigonopsis, Perty.

North American Species.

(1) NEOSPHEX, Reed.
= Pseudosphex, Tischb.

(2) SPHEX, Latreille.
(1) S. argentata, Dahlb.
(2) S. aurulentus, Fabr.
(3) S. beatus, Cam., ♂.
(4) S. Belfragei, Cr., ♀.
(5) S. brasiliensis, Sauss., ♀.
? = tinctipennis, Cam.
(6) S. caliginosus, Erich.
(7) S. chichimecus, Sauss., ♂.
(8) S. chrysophorus, Kohl.
(9) S. clavipes, Kohl., ♀.
(10) S. croesus, Lepel.
(11) S. crucis, Fabr.
(12) S. dubitatus, Cr.
(13) S. flavipes, Smith.
(14) S. habena, Say.
(15) S. ichneumonea, Linné.
var. dorsalis, Lepel.
(16) S. lautus, Cr.
(17) S. mandibularis, Cr.
(18) S. Maximiliani, Kohl.
(19) S. mixtus, Fabr.
(20) S. pennsylvanicus, Linné.
(21) S. rufipes, Lepel.
(22) S. singularis, Smith.
(23) S. spiniger, Kohl., ♂.
(24) S. T, Beauv.
(25) S. tepanecus, Sauss.
(26) S. texanus, Cr.
(27) S. vagus, Drury.

(3) ISODONTIA, Patton.
(1) I. azteca, Sauss.
= macrocephalus, Fox.
(2) I. costipennis, Spin.
(3) I. elegans, Smith.
(4) I. instabilis, Smith.
(5) I. lucæ, Sauss.
(6) I. philadelphica, Lepel.
(7) I. robusta, Cam.
(8) I. tibialis, Lepel.

(4) CHLORION, Latreille.
(1) C. aerarium, Patton.
(2) C. coeruleum, Drury.
(3) C. columbianum, Grib.
(4) C. nearticum, Kohl.
= coeruleum, Auct., *pars.*
(5) C. occultum, Kohl.
= coeruleum, Auct., *pars.*

(5) PRONÆUS, Latreille.

(6) PALMODES, Kohl.
(1) P. dimidiata, DeGeer.
=abdominalis, Cr.
(2) P. morio, Kohl.
(3) P. praestans, Kohl.
(4) P. rufiventris, Cr.

(7) CALOSPHEX, Kohl.

(8) HARPACTOPUS, Smith.
H. laeviventris, Cr.

(9) PARASPHEX, Smith.

(10) PRIONONYX, Dahlbom.
(1) P. atratus, Lepel.
(2) P. bifoveolatus, Tischb.
= canadensis, Prov.
= thomæ, Fabr., *pars.*
(3) P. brunneipes, Cr.
(4) P. excisus, Kohl.
(5) P. ferruginosus, Fox.
(6) P. thomæ, Fabr.

Subfamily II—*Ammophilinæ*.

(11) Psammophila, Dahlbom.
- (1) P. argentifrons, Cr.
- (2) P. collaris, Cr.
- (3) P. communis, Cr.
- (4) P. grossa, Cr.
- (5) P. luctuosa, Smith.
- (6) P. robusta, Cr.
- (7) P. ? violaceipennis, Lepel.

(12) Ammophila, Kirby.
- (1) A. Alberti, Hald.
- (2) A. alpestris, Cam.
- (3) A. alticola, Cam.
- (4) A. anomala, Taschb, ♀ ♂.
- (5) A. arvensis, Dahlb.
- (6) A. atriceps, Smith.
- (7) A. aureonotata, Cam.
- (8) A. azteca, Cam.
- (9) A. barbata, Smith.
- (10) A. breviceps, Smith.
- (11) A. cementaria, Smith.
- (12) A. centralis, Cam.
- (13) A. ceres, Cam.
- (14) A. Championii, Cam.
- (15) A. chiriquensis, Cam.
- (16) A. comanche, Cam.
- (17) A. conditor, Smith.
- (18) A. consors, Cam.
- (19) A. cora, Cam.
- (20) A. dejecta, Cam.
- (21) A. extremitator, Cr.
- (22) A. femur-rubra, Fox.
- (23) A. ferruginosa, Cr.
- (24) A. Gaumeri, Cam.
- (25) A. gracilis, Lep.
- (26) A. Guerinii, D. T.
- (27) A. jason, Cam.
- (28) A. inepta, Cr.
- (29) A. intercepta, Lepel.
- (30) A. iridipennis, Cam.
- (31) A. juncea, Cr.
- (32) A. macra, Cr.
- (33) A. mexicana, Sauss.
- (34) A. micans, Cam,
- (35) A. montana, Cr.
- (36) A. Montezuma, Cam.
- (37) A. Morrisonii, Cam.
- (38) A. neartica, Kohl.
- (39) A. nigricans, Dahlb.
- (40) A. nigrocoerulea, Cam.
- (41) A. picipes, Cam.
- (42) A. pictipennis, Wahb.
- (43) A. placida, Smith.
- (44) A. polita, Cr.
- (45) A. procera, Dahlb.
- (46) A. pruinosa, Cr.
- (47) A. quadridentata, Cam.
- (48) A. saeva, Smith.
- (49) A. sonorensis, Cam.
- (50) A. strenua, Cr.
- (51) A. striolata, Cam.
- (52) A. trichiosoma, Cam.
- (53) A. urnaria, Dahlb.
- (54) A. valida, Cr.
- (55) A. variipes, Cr.
- (56) A. volcanica, Cam.
- (57) A. vulgaris, Cr.
- (58) A. xanthoptera, Cam.
- (59) A. Yarrowii, Cr.

(13) Miscus, Jurine.

(14) Caloptera, Fabricius.
- (1) C. Wrightii, Cr., ♀ ♂.

Subfamily III—*Sceliphroninæ*.

(15) Sceliphron, Klug.
- (1) S. cementarius, Drury.

var. canadensis, Smith.
var. architectus, Lepel.
var. lucæ, Sauss.
var. flavipes, Fabr.
var. flavipunctum, Chrisb.
var. flavimaculatum, DeGeer.
var. jamaicensis, Fabr.
(2) S. Servillei, Lepel.
(3) S. fasciatum, Lep.
=argentifrons, Cr.
(4) S. annulatum, Cr.
(5) S. assimile, Dahlb.
(6) S. argentispilus, Prov.
(7) S. tau, D. T.
(8) S. nigriventris, Costa.
(16) CHALYBION, Latreille.
(1) C. californicum, Sauss.
(2) C. coeruleum, Linné.
(3) C. texanum, Cr.
(4) C. Zimmermanni, Dahlb.
(5) C. aztecum, Sauss.

Subfamily IV—*Podiinæ*.

(17) PODIUM, Fabr.
(1) P. luctuosum, Smith.
(2) P. rufipes, Fabr.
(3) P. bellum, Cam.
(4) P. bugalense, Cam.
(5) P. fulvipes, Cr.
(6) P. opalinum, Smith.
(7) P. petiolatum, Drury.
(18) STETHRORECTUS, Smith.
(19) TRIGONOPSIS, Perty.
(1) T. violaceus, D. T.

FAMILY XXVI.—Ampulicidæ.

This family, in general appearance and in having a petiolate abdomen, is allied to the *Sphegidæ*, but is readily separated by the mesosternum being produced into a forked process posteriorly, by the mesonotum having distinct parapsidal furrows, by the clypeus being produced posteriorly between the insertion of the antennæ, often rostrate or carinate, and by its metathoracic characters.

The species, so far as we know, prey upon cockroaches, and thus differ in their habits from the *Sphegidæ*.

The family may be divided into two natural groups, which I have designated as subfamilies, and which may be distinguished by the use of the following table :

Table of Subfamilies.

Marginal cell at apex acute, *without* an appendage ; metathorax posteriorly truncate or rounded, unarmed ; clypeus not carinate.....Subfamily I., Dolichurinæ.

Marginal cell at apex rounded, *with* an appendage ; metathorax posteriorly squarely truncate, the upper angles most frequently acute or toothed ; clypeus carinate.....Subfamily II., Ampulicinæ.

Subfamily I.—Dolichurinæ.

This subfamily is easily distinguished from the *Ampulicinæ* by a pointed, not truncate, marginal cell, by the non-carinate clypeus, and by the rounded, or at least unarmed, metathorax.

The group is unknown in our fauna, and is found principally in Australia, or at least in the Oriental region, only a single genus *Dolichurus* being found in Europe.

According to Kohl, *Dolichurus*, like *Ampulex*, preys upon Blattidæ, which they store up in their nests as food for their young.

Three genera fall into this subfamily, and may be recognized by the characters made use of in the following table:

Table of Genera.

Stigma not small, subovate; submedian cell shorter than the median; metanotum with foveolæ.....2.

Stigma small, poorly developed; submedian cell shorter than the median; metanotum with several longitudinal carinæ.

Third cubital cell smaller than the second, narrowed towards the radius; cubitus in hind wings originating a little *before* the transverse median nervure, or interstitial; metanotum above not broadened out laterally.....Dolichurus, Latreille.

Third cubital cell quadrangular, much longer than the second; cubitus in hind wings originating beyond the transverse median nervure; metanotum above broadened out laterally.....Trirogma, Westw.

2. Second cubital cell subtriangular, smaller than the third; cubitus in hind wings interstitial; metathorax rounded posteriorly; clypeus produced medially; claws toothed.....Aphelotoma, Westw.

Subfamily II.—Ampulicinæ.

In this family the marginal cell is more or less rounded at apex, with an appendage; the clypeus is subrostriform and carinate; while the metathorax posteriorly is truncate, with the upper angles most frequently acute, toothed or produced into spines.

Kohl would restrict all the species to a single genus, *Ampulex*, Jurine, treating the others as sections; but in this I cannot follow him, since I believe these sections are really genera, to which names have already been applied.

Four genera have been recognized, and are distinguishable by the aid of the following table:

Table of Genera.

Front wings with three cubital cells; pronotum often with a tubercle at base above.....2.

Front wings with two cubital cells; pronotum never with a tubercle at base above.

Metathorax subquadrate, a little longer than wide, squarely truncate posteriorly, but the superior hind angles not produced into strong teeth, at the most with a small tubercle or tooth, the dorsum with longitudinal carinæ, the interstices transversely striate; claws with a median tooth beneath; maxillary palpi 6-, labial palpi 4-jointed; head *without* a frontal area above antennæ; submedian cell not longer than the median; first flagellar joint longer than 2–3 united; pronotum fully twice as long as wide at base.....Rhinopsis, Westw.

Metathorax quadrate, the superior hind angles more or less produced into blunt tubercles or short teeth, the dorsum sculptured as in *Rhinopsis;* claws cleft; head *with* a frontal area above the antennæ, or at least with strong lateral carinæ extending from base of each antenna backwards towards the ocelli; submedian cell a little longer than the median; first flagellar joint not longer than 2–3 united; pronotum not or only a little longer than wide at base.....Waagenia, Kriechbaumer.

2. Superior hind angles of metathorax produced into strong teeth or long spines; claws cleft.

Face normal, *without* an enclosed frontal area above the antennæ; pronotum always tuberculate; abdomen in ♀ compressed at apex; metathoracic spines very long.....Chlorampulex, Sauss.

Face with a frontal area above the antennæ, which encloses the front ocellus; pronotum more rarely tuberculate; abdomen in ♀ not compressed at apex; metathoracic spines not long.....Ampulex, Jurine.

North American Species.

FAMILY XXVI.—*Ampulicidæ.*

Subfamily I.—*Dolichurinæ.*

(1) DOLICHURUS, Latreille.

(2) TRIROGMA, Westwood.

(3) APHELOTOMA, Westwood.

Subfamily II.—*Ampulicinæ.*

RHINOPSIS, Westwood.

(1) R. canaliculata, Say., ♀ ♂. = Abbottii, Westw.

(2) R. maculicornis, Cam., ♀.

WAAGENIA, Kriechbaumer.

CHLORAMPULEX, Saussure.

AMPULEX, Jurine.

(1) A. angusticollis, Spin., ♀.

A CONTRIBUTION TO THE DISCUSSION OF SPILOSOMA CONGRUA.

BY R. OTTOLENGUI, NEW YORK.

I have found the discussion of the identity of *Spilosoma congrua*, originating with the article by Rev. Dr. Fyles, most interesting, and am tempted to record certain facts not in consonance with the published views of the gentlemen who have already written.

Dr. Fyles appears to argue that *cunea* may be *congrua*. He tells us, speaking of *textor*, that there is one brood in his locality usually spotless and measuring 14 lines, and then states that "southward there is a second brood of *textor* noted for its variations, this being supposed to be the *cunea* of Drury." He then refers to Prof. Riley's figures of *cunea* (Forest Insects, page 245), and declares that with his series of bred specimens of *congrua* he can match all of Prof. Riley's figures in maculation, and especially in size.

In Prof. Smith's reply to Dr. Fyles I find this statement: "Nearly all the northern specimens *(cunea)* run small; the southern specimens, on the other hand, mostly run large."

Early in the spring of this year it will be recalled that a "cold snap" overspread the entire Atlantic coast. This cold was especially exceptional in the Southern States, and the approaching summer was so delayed that vegetation budded but two weeks earlier in South Carolina than in New York City. I spent the latter half of March in Summerville, South Carolina, and when I left the young leaves were just giving the forest a delicate green tint. Two weeks later the parks in this city were in about the same condition. I mention this to indicate the closeness of the seasons south and north this year to make my deductions more pointed. One of the first moths to appear in the vicinity of New York is what we call *cunea*, and they can be commonly expected early in April. This early brood is almost invariably spotless, or practically so. During my stay in Summerville, the nights being very cool, and even the days far from warm, insect life was not very abundantly noticeable. The only moth really common was *cunea*, of which I took about twenty specimens and saw above a hundred others. While I did not capture all that I saw, I particularly examined them, this being easy, as they were sitting at rest along the piazzas and hallways. This examination was made because I noted that these early moths were all profusely spotted, all without exception

being like fig. j of Prof. Riley's series. This astonished me because of my northern experience, and I scrutinized all that I saw, even though I did not bottle them, being on the watch for an immaculate specimen. All pure white moths found, however, proved to be *virginica*, and of these I took but three. Thus it seems improbable that Dr. Fyles's idea is correct, and that a *second* brood in the south is spotted. These insects captured by me in the middle of March, in a backward season, can hardly have come from larvæ hatched the same year. In regard to size, Prof. Smith's idea does not hold, for the largest specimen taken is slightly smaller than my smallest northern specimen.

Next, a word as to the distribution of *congrua*. Prof. Smith contends that *congrua* is not recorded (except Walker's Georgia specimens) from the south. It happens that the set in my collection is peculiar in the light of this statement. I have one male, given to me years ago by Miss Emily Morton, still bearing her label, New Windsor. Then, one male and two females from Nashville, Tennessee, and lastly, two males taken by myself in March at Summerville, So. Ca., so that of my six specimens, five are southern.

A few more words as to size and maculation, and I have done. The study of variable insects is naturally more interesting than where we have to consider species fairly constant in pattern ; but there is a point which I desire to make which I have not seen noted by any other authors, though not improbably it has been. I believe that *there is a type of pattern in all species*, and that this type will be constant, regardless of the variability. Thus, in a spotted species certain spots will be constant whether accompanied by others or not. If we have to deal with a species sometimes spotted and sometimes immaculate, then the immaculate form must be the type, and the spotted forms merely variations, though among these spotted variations there may be found a constancy as true as with a normally spotted species. Can we apply this rule to *congrua* and *cunea ?* Let us call *congrua* a spotted species and *cunea* an immaculate species, and weigh the result. Dr. Fyles records a long series of *congrua* and describes the variations of the pattern, but he has noted that on his most immaculate form there was a small black dot on the median nerve at the angle of the second fork. This dot he records on all his varieties, and it is therefore the constant character which prevents us from considering that the typal pattern is immaculate. Nevertheless, later he tells us that with his

series he has been able to match all of Prof. Riley's figures of *cunea*, overlooking the fact that the dot at the fork is not a constant feature of Prof. Riley's series, if, indeed, it occurs at all exactly as it does in *congrua*. Examining my own six specimens of *congrua*, which vary considerably otherwise, the dot at the fork is present in all. My New Windsor specimen is immaculate except for the dot. The three from Tennessee all have the dot, but also a faint row of spots near the outer margin. My Summerville specimens are worthy of special mention. I was inclined to think they might represent a new species, until Dr. Dyar expressed a contrary view. It is still possible that they are distinct; I have not yet had time to give full study to the subject. On Dr. Dyar's opinion, however, they may rest for the present as *congrua*. They have the spot at the fork and a row of spots near the border, in this respect matching the Tennessee specimens very well. But the outer half of the costa is black, the tips are blackish, and the upper half of the fringes are also blackish. At a casual glance one would say they had been soiled in an electric-light globe, but there being two specimens similarly marked and having been taken where the only electric lights were enclosed in incandescent globes, the dark parts must be considered as normal. Moreover, Dr. Dyar tells me he has seen one specimen in which all of the primary was smoky.

In regard to *cunea* there is certainly a purely immaculate form, nine such specimens being before me. Dealing with the spotted forms, can we find the typal pattern which is constant? I think so; and it is not a spot at the fork; it is, I think, a spot on the costa, near the base. I have a specimen showing this spot, which is otherwise immaculate, and my series includes seventeen specimens, in every one of which this spot on the costa occurs, in the more maculated forms being the top of a veritable band. The extreme of my series is so suffused that the bands nearly coalesce, giving the primaries an almost uniform colour. Curiously enough, this is one of my Summerville specimens, and is as small as any that I have.

In regard to size, it seems very certain that *congrua* is a much larger species, even though the smallest *congrua* may match the largest *cunea*. My *cunea* range from 30 mm. (♂) to 35 mm. (♀), while my *congrua* range from 35 mm. (♂) to 45 mm. (♀).

There is no doubt in my mind that *congrua* is distinct from the *cunea* forms, but is it possible that the immaculate and the spotted forms of *cunea* may be distinct?

NEW SPECIES OF NORTH AMERICAN MYRMELEONIDÆ.

BY ROLLA P. CURRIE, WASHINGTON, D. C.

V.

In the CANADIAN ENTOMOLOGIST for March, 1899, page 70, Mr. Nathan Banks describes a new species of Brachynemurus under the name *tuberculatus*. The specimen used in drawing up the description was a female, and as I find a male of this species in the National Museum collection, a description of it is given here:

Brachynemurus tuberculatus, Banks.

Male.—Length, 21.5 mm.; expanse of wings, 33 mm.; greatest width of anterior wing, 3.6 mm.; length of antennæ, 4 mm. Much smaller and more slender than the female.

Antennæ longer and less clavate. The form of head and thorax is similar to that of the female and the markings are similar.

Abdomen pale luteous, clothed with white and black hairs; an interrupted longitudinal fuscous line on the dorsum, and a broader, less clearly defined stripe each side; segments of apical third of abdomen almost entirely fuscous.

Appendages similar in form and proportionately as long as those of *B. Sackeni;* black, clothed with long black and white hairs; each appendage armed, interiorly, with about a dozen strong, blunt, black spines.

Wings smaller, more slender, and less heavily marked than in the female.

Type.—No. 4328, U. S. National Museum. Collected in Madera Canyon, Santa Rita Mts., Arizona, June 8, 1898, by Mr. E. A. Schwarz.

Two more specimens of this species, females, were collected at the same locality by Mr. Schwarz on June 8 and 14, respectively.

Brachynemurus papago, new species.

Male.—Length, 40 mm.; expanse of wings, 57.5 mm.; greatest width of anterior wing, 7.5 mm.; length of antenna, 7 mm. Slender; above luteous, marked with fuscous; below, principally fuscous; clothed with black and white hairs, especially on the abdomen.

Face nearly flat, luteous; upper part, between and surrounding the antennæ, piceous, sending a median line and one on each side down to the clypeus. Circumocular area luteous, a few fuscous spots posteriorly. Clypeus luteous, clouded with fuscous. Labrum transverse, luteous;

rounded laterally and anteriorly narrowed, emarginate in front. Mandibles piceous.

Maxillary palpi moderate, piceous, luteous at articulations ; first two joints short, about as broad as long, subequal ; third joint a little longer than first two together, somewhat curved ; fourth slightly shorter than third ; apical joint as long as third, subcylindrical (very slightly swollen medially), darker piceous ; tip truncate, pale.

Labial palpi a little longer than maxillary ; first joint twice as long as broad, piceous ; second joint about three times as long as first, curved, swollen apically, luteous, piceous at base ; apical joint fusiform, piceous, moderately hirsute ; tip fine, truncate, pale.

Maxillary palpigers luteous, with fuscous spots. Labium and mentum luteous, the former with a longitudinal median dark line.

Antennæ somewhat clavate, scarcely as long as thorax, fuscous, with very short, stiff hairs ; club paler ; articulations luteous ; first two joints luteous, clouded with piceous, the base of first joint surrounded by a luteous ring.

Vertex elevated behind, rounded, luteous ; depressed portion anteriorly dark fuscous ; elevated portion with two transverse, dark fuscous bands, the posterior more irregular and broken ; a mesial fuscous spot on posterior margin.

Pronotum with three longitudinal dark fuscous lines each side ; the median pair coalesce midway between front and hind margins, diverging posteriorly and anteriorly ; the outermost line on each side extends forward not quite to the transverse furrow. Beneath luteous, a longitudinal fuscous streak on each side near carina.

Meso- and metanotum with the lobes moderately elevated ; markings similar to those of *B. Hubbardii*. Sides and sterna fuscous, with luteous markings.

Abdomen above luteous for the basal two-thirds, a longitudinal dark fuscous line in the middle. Sides and venter fuscous. Apical segments dark fuscous, a few small, indistinct, luteous spots above. Apical segments thickly hirsute.

Appendages similar to those of *B. peregrinus* or *B. Coquilletti*, but still shorter, blunter, and more divaricate ; beset with the usual long coarse hairs or bristles ; dark fuscous, pale on inner sides ; the inferior triangular projection luteous.

Legs moderate, luteous, dotted and blotched with fuscous, beset with white and black hairs and spines; tibiæ piceous at bases and apices. Tibial spurs as long as first tarsal joint, slightly curved, rufo-piceous. Tarsal joints piceous apically, the third and fourth entirely so; claws slightly more than half the length of last tarsal joint, rufo-piceous.

Wings like those of *B. niger* and *B. brunneus*, though broader, and with markings darker than in the male of the latter species—almost equalling in size and in extent and intensity of the markings those of the females.

Female.—Length, 29 mm.; expanse of wings, 56 mm.; greatest width of anterior wing, 7.5 mm.; length of antenna, 5 mm.

Antennæ more clavate than in male. Abdomen a little shorter than wings, marked as in the male, but the luteous on dorsum extends further posteriorly. Tip of abdomen with long black hairs, principally dark fuscous; inferior part with coarse, blunt, black spines; below, two small cylindrical appendages, fuscous, with long black hairs. Markings of wings rather more pronounced than in the male.

Type.—No. 4369, U. S. National Museum. One male specimens, collected in Madera Canyon, Santa Rita Mts., Arizona, June 7, 1898, by Mr. E. A. Schwarz.

No. 4369a, U. S. National Museum. One female, with same locality and date, collected by Mr. Schwarz.

Named after the Indian tribe living in this section of country.

This species has the wings of *B. niger* or *B. brunneus*, six prothoracic lines as in *B. Sackeni*, and meso- and meta-notal markings similar to those of *B. Hubbardii*. The abdomen and appendages resemble those of *B. peregrinus*.

Brachynemurus pusillus, new species.

Female.—Length, 19 mm.; expanse of wings, 36.4 mm.; greatest width of anterior wing, 4.7 mm.; length of antenna, 4 mm. Slender; head and thorax luteous, marked with fuscous; abdomen principally fuscous.

Face flat, luteous, the portion behind and in front of antennæ piceous, a more or less distinct luteous spot between the antennæ; a dark line extends from the piceous area in front down towards the clypeus. Circumocular area luteous, with some fuscous spots behind. Clypeus

luteous. Labrum luteous, obscurely clouded with fuscous. Mandibles piceous.

Maxillary palpi moderate, luteous ; first two joints short, subequal ; third about the length of 1 plus 2 ; fourth somewhat shorter than third ; apical joint as long as third, tip narrowed, truncate.

Labial palpi about same length as maxillary ; first joint short, twice as long as broad ; second joint three times longer, curved, apically enlarged ; apical joint as long as second, fusiform, sparsely haired, tip fine, truncate.

Maxillary palpigers luteous, marked with fuscous. Labium and mentum luteous.

Antennæ strongly clavate, scarcely as long as thorax, moderately hirsute, luteous, a fuscous spot on nearly all the joints ; club thickly spotted with fuscous above ; two basal joints luteous, shining.

Vertex elevated, luteous ; two transverse fuscous bands on elevated portion, the posterior band very irregular.

Pronotum longer than broad, strongly narrowed anteriorly, somewhat rounded in front ; a broad longitudinal median fuscous band, interrupted at the transverse furrow, but continued beyond it ; the band is more or less divided lengthwise by a faint luteous line ; the portion behind the furrow is anteriorly exteriorly excised ; an irregular, interrupted fuscous line and some small spots each side. Beneath luteous, a fuscous streak each side near carina.

Mesonotum with lobes moderately elevated, with a number of long curved black bristles and some smaller white hairs ; anterior lobe fuscous, divided longitudinally by a fine luteous line, a round luteous spot each side ; lateral lobes luteous, each with a C-shaped fuscous spot, opening externally, and other irregular spots ; between the lateral lobes and going back across the posterior lobe is a fuscous band, extending laterally in front, forming a T-shaped marking. Sides and sterna luteous, spotted with fuscous.

Metathorax marked similarly to the mesothorax.

Abdomen fuscous ; dorsum with the articulations and an irregular spot in the middle of each segment luteous. Tip of abdomen with the usual long hairs and short, coarse, black spines ; below, two small yellow cylindrical appendages with long black hairs.

Legs moderate, luteous, dotted with piceous on femora; apices of femora and tibiæ piceous; each tibia encircled with another transverse piceous band near base, less pronounced on posterior legs. Tibial spurs as long as first two tarsal joints on anterior and middle legs, shorter on posterior, moderately curved, rufo-piceous; tarsi with third and fourth joints and tip of the apical one piceous; claws slightly more than half the length of last tarsal joint, rufo-piceous.

Wings a little longer than abdomen, hyaline, the posterior margins slightly incurved apically. Outer half of pterostigma luteous, inner half fuscous. Apical third or more of intercostals forked in anterior wings, a less number in the posterior wings. Veins hairy, the costa mostly luteous, the subcosta fuscous, interrupted with luteous between transversals; other veins fuscous, less regularly interrupted with luteous.

Anterior wings with a series of fuscous spots between the subcosta and the vein immediately below it—these spots for the most part cover the transversals; a few rather large spots on anterior side of submedian vein and one at its tip; another spot at the tip of postcosta, near hind margin; smaller forks near apices of wings clouded with fuscous; posterior wings a little shorter and narrower than anterior, unspotted. Posterior borders of both wings fringed with fine hairs.

Male.—Length, 18 mm.; expanse of wings, 33.5 mm.; greatest width of anterior wing, 3.8 mm.; length of antenna, 4 mm. Somewhat smaller than the female; antennæ less clavate; appendages extremely short (not discernible in this specimen except with a lens), blunt, luteous, clouded with fuscous; inferior triangular projection luteous, with long dark hairs.

Type.—No. 4370, U. S. National Museum. One female from the college campus, Mesilla Park, New Mexico, June 13th, collected by Prof. T. D. A. Cockerell.

No. 4370a, U. S. National Museum. One male collected in Madera Canyon, Santa Rita Mts., Arizona, June 14th, 1898, by Mr. E. A. Schwarz.

Co-type.—One female collected at Fort Grant, Arizona, July 12th, 1897, by Mr. H. G. Hubbard.

This species is remarkable on account of its small size and the prominent spots on the anterior wings. The abdomen is marked very much as in *B. Sackeni*. The short abdomen and inconspicuous appendages of the male are also peculiar.

OBSERVATIONS UPON BOMBYX CUNEA, DRURY, ETC.

BY THE REV. THOMAS W. FYLES, SOUTH QUEBEC.

Messrs. Dyar, Smith, and Grote have given us much interesting information concerning *Bombyx cunea*, Drury, and insects associated with it. I have hoped that further particulars would be forthcoming, for the position these insects have held in our Entomological lists has not been satisfactorily established.

It is very evident that much perplexity in regard to *cunea*, and the rest, has existed from Walker's day down to the present time.

Let us recall some of the facts connected with them that have come under our notice.

In 1770, Drury figured a moth which he named *Bombyx cunea*—probably from a fancied resemblance in the coloration of the insect to that of the spotted carriage-dog of Europe. He did not show the hind tibiæ of the insect.

Eighty-five years afterwards, Walker described certain insects that he found in the British Museum collections. Six of them from Georgia and two from New York he classified as *Spilosoma cunea*, believing them to belong to the species figured by Drury. Three of them from Georgia he described as a new species, under the name of *Spilosoma congrua*. He did not describe the hind tibiæ of either kind.

It was Harris who originated the generic term, *Hyphantria*. In his "Insects Injurious to Vegetation," edited by Flint (1862), p. 358, we read:

"This species was first described by me in the seventh volume of the *New England Farmer*, page 33, where I gave it the name of *Arctia textor*—the weaver—from the well-known habits of its caterpillar. Should it be found expedient to remove it from the genus *Arctia*, I propose to call the genus which shall include it, *Hyphantria*—a Greek name for weaver—and place in the same genus the many-spotted ermine-moth, *Arctia punctatissima*, of Sir J. E. Smith, which is found in the Southern States, and agrees with our weaver in habits."

Harris says nothing about the posterior tibiæ of either *textor* or *punctatissima*. The weaving habits of the larvæ suggested the names he gave: *Hyphantria* (Gr.), a female weaver; *textor* (L.), a male weaver. He believed that *punctatissima* and *textor* were distinct, specifically, one from the other.

It has since been discovered that there are slight structural differences of the hind tibiæ between insects of the genus Hyphantria and insects of the genus Spilosoma. (Smith, CAN. ENT., Vol. XXII., pp. 161, 163; Dyar, CAN. ENT., Vol. XXXI., p. 156.)

Drury's types have long been lost: Walker's have been destroyed, or are in hopeless confusion. We may, then, pertinently ask this question,—

Is it anything more than an assumption that Drury's moth would properly come in the genus Hyphantria?

Several writers have supposed *punctatissima* and *cunea* to be identical; but in reality we have nothing to guide us respecting *cunea* except Drury's figure, and Walker's description, which reads as follows:

"White; abdomen yellowish, white on the hind borders of the segments and towards the tip, and with one dorsal, one ventral, and two lateral stripes of black spots.

"Fore wings with four irregular oblique macular, more or less imperfect, brown bands.

"*Female.*—Hind wings with some brown submarginal spots. Length of the body, 5–6½ lines; of the wings, 13–18 lines." *Cat. Lep. Het. B. M.*, III., p. 669n. 7 (1855).

Unfortunately, we cannot attach as much importance to this description as we could wish, because of Prof. Grote's testimony as to the perplexity under which Walker laboured. (See CAN. ENT., Vol. XXXI., p. 268.) We are, therefore, thrown back mainly upon Drury's figure; *and we find it sufficient.*

In 1890, the Department of Agriculture, Washington, issued a report on the insects affecting forests trees, by Dr. A. S. Packard. In it is an account of the Fall web-worm, copied from Professor Riley's "Our Shade Trees and their Insect Defoliators."

On page 246, Riley is thus quoted:

"The moths vary greatly, both in size and coloration. They have in consequence of such variation received many names, such as: *cunea*, Drury; *textor*, Harr.; *punctata*, Fitch; *punctatissima*, Smith (Fig. 87). But there is no doubt, as proven from frequent breeding of specimens, that all of these names apply to the very same insect, or at most to slight varieties, and that Drury's name, *cunea*, having priority, must be used for the species."

Riley illustrated his position by cuts, under which we find:

"Fig. 87.—*Hyphantria cunea : a–j*, wings of a series of moths, showing the variations from the pure white form to one profusely dotted with black and brown."

Doubtless, Riley believed that he was portraying *cunea*, *textor*, *punctata*, and *punctatissima*, but strange to say,—

Not one of his cuts answers to Drury's figure !

I need not enlarge upon this. Let anyone who is interested in the matter take Riley's figure 87, and place it beside Drury's—either in the original or in Westwood's reprint—and the discrepancies will at once strike the eye.

In my former paper I spoke of a much-spotted Spilosoma taken in company with *S. congrua* at the Gomin Swamp. I have long known insects of this kind. The late Mr. F. B. Caulfield showed me one, twenty years ago ; and I have met with other specimens since. No one acquainted with this moth would believe that it came from a Fall web-worm. Five specimens of it were taken in this locality in 1897. I have a pair of them in my collection, and I have just compared the male with Drury's figure in Westwood's reprint, and it agrees with it exactly—so exactly that one might imagine it to be the very specimen from which the engraver worked. I give a description of these insects :

Expanse of wings, 16½ lines ; breadth of fore wing, 4 lines ; breadth of hind wing, 4½ lines ; length of body, 8 lines.

Thorax broad, white above and fluffy ; abdomen yellow with white borders to the segments and a white tip, and with five longitudinal rows of black dots. Antennæ pectinated, white above and dark brown beneath ; eyes brown ; palpi dark brown ; fore part of thorax under the head brown ; front legs—femora luteous, spotted with black on the inner side ; tibiæ and tarsi white on the outer side, dark brown on the inner ; the tibiæ of the middle and hindmost pairs of legs spurred. Fore wings white with a faint testaceous tinge, and with four irregular broken rows of brown spots. The spots near the apex are somewhat elongated and wedge-shaped. From the apex to the middle of the hind margin, close to the fringe, is a row of brown dots. On the under side of the fore wings there are some dark brown apical dashes, and a brown lunette towards the middle of the wing, but nearer the costa than the hind margin. The hind wings have a brown lunette near the middle of the upper part, and

a subterminal row of spots and dashes—these are more conspicuous on the under side than on the upper.

In the female the dimensions and spots are much the same as in the male. The antennæ are of course without pectinations ; the fore part of the thorax underneath is luteous ; the black spots on the luteous femora are very conspicuous.

Here, then, apparently, we have Drury's insect.

I was inclined at first to think it an extreme form of *congrua*. It was taken at the same time and in the same locality as that insect, and in contour and size the two are very similar ; but I find, on the other hand, that of all my twenty-eight bred specimens of *congrua*, not one has anything like the spotted underwing that is so remarkable in Drury's figure. Six of them have a faint dot in the upper part of the secondaries, just such as is given in cuts *i* and *j* in Riley's "Fig. 87," and that is all.

The question of locality does not come in here. We know not how wide or how restricted a field this true *Spilosoma cunea*, Drury, may have. The species is rare, but it exists !

With regard to *Spilosoma congrua*, we have these particulars :

(a) Walker described it.

(b) Prof. Grote found it in Walker's keeping ; spoke to him about it ; made a further description of it.

(c) Dr. Hulst and others have bred it.

(d) S. Antigone has been found to be identical with it.

The whole matter seems to be very clear ; and our lists should read:

SPILOSOMA, Steph.
cunea, Drury.
congrua, Walker.
Antigone, Strk.
HYPHANTRIA, Harris.
Punctatissima, S. & A.
textor, Harris.

A COCCID FROM THE FAR NORTH.

BY T. D. A. COCKERELL, N. M. AGR. EXP. STA.

Eriococcus borealis, n. sp., ♀.—Sacs on twigs, closely felted, rather rough, broad oval, grayish-white, about 2½ mm. long. Female oval. Mounted specimens full of embryos are nearly 3 mm. long. Gives no red colour on boiling in caustic potash. Skin after boiling, greenish or

grayish, thickly beset with round to oval hyaline spots. Dermal spines only moderately numerous, 27–45 μ long, the shorter ones more numerous than the longer. Caudal lobes long, brownish, irregularly cylindrical, about 42 μ broad and 90 μ long. Buccal apparatus about 120 μ broad; rostral loop rather short; mentum rather long. Antennæ and legs pale brown; antennæ varying from 7- to 8-jointed, the joints after the first measuring as follows in μ: — 8-jointed form: (2.) 30, (3.) 45, (4.) 27, (5.) 24, (6.) 24, (7.) 27, (8.) 36. Formula 382 (47) (56). 7-jointed form: (2.) 42, (3.) 54, (4.) 51, (5.) 24, (6.) 24, (7.) 29. Formula 3427 (56). Hind legs: coxa 120, femur with trochanter about 180, tibia 111, tarsus 126, claw 26 μ. Anterior legs: tibia 90, tarsus 111 μ. Tarsus always longer than tibia. Young dark crimson, with a fringe of glassy rods.

Hab.—On willow *(Salix)*, Dawson City, 64° N. Lat., collected by Mr. John Morley; sent to me by Mr. Alex. Craw. *E. borealis* is peculiar for the dermal markings, and the antennæ varying from 7 to 8 joints.

LEPISESIA ULALUME, STRECKER, IN BRITISH COLUMBIA.

BY ARTHUR GIBSON, CENTRAL EXPERIMENTAL FARM, OTTAWA.

In a box of Lepidoptera sent to the Division of Entomology, for identification, by Mr. W. A. Dashwood-Jones, of New Westminster, B. C., was a specimen of the above named sphingid. The specimen was kindly named by Dr. J. B. Smith, who wrote of it, saying: "It is a genuine rarity, and in 1888 there was not a specimen known save the type. If I remember rightly, this is the first specimen other than the type that I have ever seen." Mr. Dashwood-Jones states that this season he took seven specimens of *ulalume;* and, further, that he takes them every year in his garden, on white lilac blossoms. He mentions that he has never seen this moth anywhere else, but that for a few days in spring they appear to be fairly plentiful. Dr. Fletcher tells me that three years ago, when examining some insects in the Department of Agriculture of British Columbia, he saw two specimens, taken by Mr. W. A. Lawes at Enderby, B. C., which he now thinks were *ulalume*, but which at the time he thought were large specimens of *flavofasciata*. Mr. Dashwood-Jones has kindly presented to the Division a second specimen, which has a flush of yellow on the disk of the secondaries.

OBITUARY.

On the 16th of October there passed away, at Peterborough, one of the original members of the Entomological Society of Ontario. The Rev. Vincent Clementi, B. A., died at the age of eighty-seven years. He was a clergyman of the Church of England, but had retired from active service some years ago, in consequence of failing eyesight and other infirmities. Born in England, the son of a famous musical composer, U. Clementi, Esq., and educated at the University of Cambridge, he came to Canada in 1855 and settled in Peterborough. In 1863 he was appointed rector of Lakefield, where he remained for eleven years; he then became rector of Lindsay, and on his retirement returned to Peterborough to spend the rest of his days. He was an active member of the Masonic Society, and rose to be Chaplain of the Grand Lodge of Ontario. In his younger days, and indeed throughout the whole of his life, he was devoted to natural history, horticulture, and art, and was especially interested in entomology. He contributed occasionally to the early volumes of this magazine, and took a hearty interest in the welfare and success of the Society. His water-colour drawings of insects were remarkable for their accuracy and beauty of execution. He was held in the highest respect and regard by all who knew him, and died in a good old age, a devout and upright man. To his sorrowing widow, the aged partner of his life, we beg to tender our deep and respectful sympathy.

BOOK NOTICES.

General Index to Miss Ormerod's Reports on Injurious Insects, 1877 to 1898.—By Robert Newstead, F. E. S. London: Simpkin, Marshall & Co. (Price, 18 pence.)

For twenty-two years Miss Ormerod has been issuing her valuable Reports of Observations on Injurious Insects, and in them has furnished a most useful mine of information regarding all the principal insects that have been productive of injury in the British Isles during this long series of years. To render this mine readily available at any moment, a very satisfactory index has been prepared by Mr. Newstead. The greater part of it consists of a "General Index," in which reference is given to every insect treated of in the Reports under its scientific name, with references also to habits, modes and subjects of attack, etc. This is fol-

lowed by a "Plant Index," with references to the insects attacking each; a similar "Animal Index," and a third comprising other matters attacked, such as bones and leather, seeds, etc.

We are glad to learn from her preface to the volume that Miss Ormerod is about to begin a Second Series of Reports in a somewhat different form. We earnestly hope that she may long be spared to continue her noble work.

INDEX OF SPECIES TO KIRBY'S SYNONYMIC CATALOGUE OF LEPIDOPTERA HETEROCERA.—Vol. I., Sphinges and Bombyces. By Herman Strecker, Ph. D., Reading, Pa. (Price, 50 cents.)

This pamphlet, of forty-five pages, represents an enormous amount of tiresome and painstaking work, and will surely be welcomed by everyone who has occasion to consult Kirby's great catalogue of the two families mentioned above. Without this index, the nine hundred pages and over are, as Dr. Strecker states, a sealed book to almost everyone; an index to genera alone is comparatively useless in consequence of the changes in nomenclature that are constantly taking place; it is by the specific name that an insect is really known. The index contains fully 8,000 names, and gives the page or pages in the catalogue where each one occurs. For instance, to take one or two names at random, Affinis has twenty references, Basalis thirty-two; but the great majority only one. The thanks of all students of the Lepidoptera are certainly due to Dr. Strecker, and they can best manifest their gratitude by sending to him for a copy, in order to save him from pecuniary loss.

THE NORTHWEST (CANADA) ENTOMOLOGICAL SOCIETY.

The first annual meeting of this Society was held at Lacombe, Alberta, on Tuesday, November 7th, and was well attended by members, agriculturists, and others. A full account of the proceedings will be published in the Annual Report of the Entomological Society of Ontario. The following were elected officers for the ensuing year:

President—Percy B. Gregson, Esq., Waghorn, Alberta.

Vice-President—Rev. Matthew White, Lacombe.

Librarian-Curator—Arthur D. Gregson, Esq., J. P., Waghorn.

Secretary-Treasurer—Percy B. Gregson, Esq.

Council—Rev. J. Hinchliffe, Red Deer, Alta.; William Wenman, Esq., Red Deer; T. N. Willing, Esq., Olds, Alta.; F. H. Wolley-Dod, Esq., Calgary, Alta.

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